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OF THE

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VOLUME XIII

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OF THE

AMERICAN ASSOCIATION OF GENITO-URINARY SURGEONS

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The Mayo Clinic, Rochester, Minn.

May 31, June 1 and June 2, 1920

Vol. XIII

ERRATUM

(To be inserted in VOLUME 12, page XIII, under "War Activities of Members of the Association.")

Dr. WILLIAM E. LOWER, Lieutenant-Colonel, M. C., U. S. A. Served abroad with No. 9 General Hospital, B. E. F., first as Assistant Director of the Surgical Service and later as Commanding Officer.

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In Memoriam

Dr. John Van der Poel, *Fellow*

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THE AMERICAN ASSOCIATION OF GENITO-URINARY SURGEONS

FIRST DAY, MAY 31, 1920

ABSCESS OF THE PROSTATE

HERMAN L. KRETSCHMER

Chicago

This paper is based upon a series of 43 cases that were seen in hospital, consultation and private practice.

Abscess of the prostate is generally looked upon as a complication of gonorrhea. Most text books on genito-urinary surgery consider it as a complication, and in a discussion of this subject one finds it described under the heading of complications of gonorrhea.

There are cases of abscess of the prostate, however, which are not complications of gonorrhea. It is a well known fact that abscess of the prostate may occur as a complication of some of the acute infectious diseases, such as typhoid fever, mumps and influenza. This fact has again been called to our attention by Bugbee, who in a recent paper was able to report 5 cases of abscess of the prostate that were seen as complications of cases of influenza that occurred in the recent epidemic. Guiteras' case of abscess of the prostate, occurring in an attack of measles, is another example of this type of case, met with in the course of one of the acute infectious diseases.

There is still another group of cases in which the abscess is metastatic in origin and in which a primary focus of suppuration can be demonstrated. It would appear, upon careful study, that this type of case occurs more frequently than is generally the opinion.

In this series of cases we had a number of instances in which an abscess of the prostate followed a focus of infection remote from the prostate. These cases seemed to be of sufficient interest to merit a detailed report and will be considered later in the paper.

For purposes of study these 43 cases have been divided into the following groups:

1. Cases complicating gonorrheal urethritis.
2. Metastatic abscess of the prostate.
3. Abscess of the prostate following trauma to the urethra, e.g., instrumentation.
4. Abscess of the prostate associated with hypertrophy.
5. Abscess of the prostate associated with strictures of the urethra.
6. Abscess of the prostate associated with appendicitis.
7. Abscess of the prostate associated with stone.
8. Abscess of the prostate in which the etiology was not determined.
9. Abscess of the prostate and general sepsis.

Of these 43 cases, there was one in which the age was not stated. The decades in which abscess of the prostate occurred were:

YEARS	CASES	PER CENT
Not stated	1	0.0232
11 to 20	1	0.0232
21 to 30	11	0.2558
31 to 40	15	0.3488
41 to 50	11	0.2558
51 to 60	1	0.0232
61 to 70	3	0.0697

Previous operations. One patient had been operated upon—an external urethrotomy and an epididymotomy—many years before the abscess of the prostate developed. Another patient had had his right testicle removed because of traumatism, the abscess, which was gonorrheal in origin, developing four months after the testicle operation. One patient was operated upon for rectal abscess in 1919 and also for fistula in ano, the abscess developing

after the passage of sounds. Another patient had been operated upon for suppurative appendicitis and had left the hospital twelve days before he was readmitted because of complete retention of urine. In view of the fact that he had never had gonorrhea and there was no evidence of past or present gonococcus infection at the time, it is reasonable to assume that there was some causal relation between the suppurative process in the appendix and the prostatic abscess. These cases will be considered in detail later in the paper.

Previous illnesses. Of this series of 43 cases of abscess of the prostate, 30 cases gave a positive history of gonorrheal infection, either recent or remote. Thirty of these cases showed at the time of admission to the hospital the presence of an acute or chronic urethral discharge, or gave a history of a recent gonorrheal infection. Examination of the discharge showed the presence of the gonococcus in 16 cases.

Routine blood Wassermann reactions and gonococcal complement fixation tests were not made in all the cases, this not being possible for various reasons. The Wassermann reaction was reported negative in 16 cases and positive in 3 cases. Gonococcal complement fixation tests were made in 22 cases. In 11 the tests were negative, and in 11, positive.

In the 11 cases in which the gonococcal complement fixation test was positive, gonococci were found in the urethral discharge or in the pus obtained from the abscess. In the 11 negative reactions, 7 patients showed the presence of an urethral discharge and 3 had gonococci in the discharge. Two of the remaining 5 cases were metastatic cases; one secondary to a carbuncle, the other to an osteomyelitis of the finger. One patient had been treated with sounds. In 1 case there was no venereal disease present. The remaining 2 cases gave a history of a chronic discharge.

Examination of pus from the abscess. In 8 cases gonococci were found in the pus obtained from the abscess. Staphylococci were recorded in 5 cases; streptococci in 1 case; both staphylococci and streptococci in 2 cases; and B. coli in 1 case. In 1 case the cultures remained sterile, and microscopic examination

of the pus failed to show the presence of organisms. The 4 cases showing staphylococci in the prostatic pus, yielded the following data:

One patient had no evidence of gonorrhea at the time he entered the hospital. One patient had all the symptoms and signs of active gonorrhea, including a positive gonococcal complement fixation test. The third patient had no signs of gonorrhea: and the fourth occurred in a patient, aged sixty-seven, who had been catheterized, because of retention due to hypertrophy. The 2 cases showing a combination of staphylococcus and streptococcus, were nonvenereal cases.

Leucocyte counts. There were 23 cases in which blood counts were made and all showed the presence of a leucocytosis. The highest leucocyte count recorded was 30,000. With the opening of the abscess surgically, or its rupture into the urethra, a prompt drop in the leucocyte count occurred. The differential leucocyte count showed the presence of an increase of the polymorphonuclears. A differential leucocyte count was not made in all the cases. In 1 case, in which this was done, the presence of an eosinophilia was found.

METASTATIC CASES

Metastatic abscess of the prostate is a rather uncommon clinical picture, and the prostatic condition is often not recognized until late in the course of the patients illness, being overshadowed by the primary focus until the onset of complete retention of urine or painful and difficult defecation, at which time a rectal examination is made. Von Frisch has reported 2 cases of this type: one associated with a severe phlegmon of the forearm and the other secondary to a phlegmonous angina. Legrain has reported a case in which the primary focus was a phlegmon of the forearm in which the thumb was amputated because of necrosis of the bone of the thumb. In 1 of my cases there was a necrosis of the last phalanx of the index finger.

In 1 case in this group, the patient gave a very definite history of acute tonsillitis with chills and fever. A few days after the

onset of the acute tonsillitis, the patient was seized with symptoms which were attributed to an attack of acute cystitis. Urination became more difficult and painful, and complete retention set in, necessitating the use of an indwelling catheter. A perineal operation was done elsewhere and pus evacuated. Unfortunately, complete data are not available in this case.

A case recently reported by Randall was metastic in origin, the primary focus being a series of boils.

As examples of this type of prostatic abscess, permit me briefly to present the following cases:

Case I. R. U., aged forty-eight. Referred by Dr. Cramps.

Previous illnesses. Venereal infection denied.

Present illness. Four weeks before admission to hospital, patient developed a felon on the index finger of his right hand. This was opened by his physician and treated with wet dressings. A fortnight later he developed repeated attacks of chills and fever, at which time he was obliged to urinate from ten to twelve times during the day and from five to six times at night. He also complained of pain in the region of the rectum, which radiated toward the base of the bladder and was associated with the act of urination. Difficult urination began a week later and gradually increased in severity so that he developed complete retention.

Examination. A suppurative wound on the index finger of the right hand. External genitalia, negative; no discharge. Urinalysis: specific gravity 1,020; trace of albumin, sugar and casts negative, few pus cells and a few red blood cells. Examination of the blood showed a leucocytosis of 28,000. Wassermann reaction and gonococcal complement fixation test, negative.

Rectal examination. An enormous, soft, fluctuating swelling in the region of the prostate. The swelling extended beyond the reach of the finger; hence, the seminal vesicles could not be felt. The prostate was very painful upon examination.

A perineal operation was performed and the abscess drained. An abscess was found in each lobe.

Examination of the pus from his finger showed the presence of streptococci, and the pus obtained from the prostatic abscess, streptococci, staphylococci and bacilli.

Blood cultures were made on two different occasions and each set of blood cultures remained *sterile.*

Case II. D. Y., aged forty-three. Referred by Dr. Daniel E. Murphy.

Previous illnesses. Venereal disease denied.

Present illness. The patient had been under treatment by his family physician for a carbuncle in the back of his neck, which had been incised and drained. Two weeks before admission to hospital, patient began to have freguent urination to so great an extent that he was obliged to void every few minutes during the day and four or five times at night. He complained of pain, associated with the act of urination which was located chiefly in the glans penis. Increased difficulty of urination gradually developed; this caused him to strain a great deal which was accompanied with very severe pain in the rectum. The day before admission, he developed complete retention of urine which necessitated catheterization that night.

Examination. A partly healed wound in the back of his neck. Above the symphysis pubis was felt a large mass which was interpreted as being due to a distended bladder. External genitalia, negative; no discharge. Examination of the urine showed urinalysis: specific gravity 1,018, acid, albumin, and some pus cells. Cultures showed B. coli.

Rectal examination. A large, smooth, fluctuating mass was felt in the left half of the pelvis. This mass was as large as a peach. The seminal vesicles were not felt.

Blood examination showed a leucocytosis of 15,600. Wassermann reaction, negative; gonococcal complement fixation test, negative.

A perineal operation was performed and the abscess drained.

B. staphylococcus aureus in the cultures made from the pus obtained from the abscess, and in the pus obtained from the wound in his neck.

A blood culture was made, but this remained sterile.

Blood cultures were made, because both these cases were evidently decidedly metastatic. In the first case blood cultures were made on different days and both sets were negative. In the second case, only one blood culture was made and this remained sterile. Both cases entered hospital long after the beginning of the abscess.

ABSCESS OF THE PROSTATE FOLLOWING INSTRUMENTATION

Prostatitis and epididymitis may be noted very often after the rough and careless passage of sounds, metal catheters, cystoscopes, etc. These complications may occur in venereal as well

as in non-venereal cases. Abscess of the prostate following urethral instrumentation is not seen so frequently as the previously mentioned complications. It may be possible that some of the cases developing severe local symptoms after urethral instrumentation are in reality cases of abscess which are many times over-looked, or that they progress up to a certain point, undergo resolution and for this reason are not recognized.

In several of the gonorrheal cases the patients' symptoms developed soon after the passage of metal instruments by the local physicians, who disregarded the fact that a profuse gonorrheal discharge was present at the time. There can hardly be any doubt between cause and effect in cases in which the acute onset of symptoms followed immediately after instrumentation. Five of Randall's 8 cases gave a history of previous urethral manipulation; such as, deep injections, passage of sounds, irrigations with potassium permanganate and catheterization.

In the series of 43 cases reported in this paper, a history of urethral instrumentation preceded the onset of symptoms of prostatic abscess in 17 cases. Of this number, 5 were gonorrheal and 12 were nongonorrheal.

As examples of the mode of onset, permit me to briefly present the following cases:

Case III. A. L., aged forty-four.

Present complaint. Acute gonorrhea two years ago. Patient has been under treatment off and on for this infection ever since onset. For several weeks prior to admission to hospital, he was under treatment by his family physician, who treated him with irrigations and the passage of large sounds. Three days before admission and after the passage of sounds, he developed an acute attack of retention. This was associated with pain in the region of the rectum and in the perineal region. Before the onset of the retention, he was obliged to urinate four or five times at night, and the force of the stream was diminished. A slight amount of dribbling occurred after urination, which was associated with burning. After onset of the retention, patient had several attacks of chills and fever.

Examinaion. A slight discharge at the external urethral orifice. External genitalia, negative. Wassermann reaction and gonococcal

complement fixation test were negative. Blood examination showed 11,800 leucocytes. Urinalysis: specific gravity 1,022 acid; albumin, blood, and pus positive.

Rectal examination. An enormous enlargement of the prostate which nearly filled the pelvis. Swelling was more marked on the left side. Fluctuation could be elicited.

A perineal operation was performed and the abscess drained.

Examination of the pus showed Gram-negative diplococci = gonococci.

Case IV. E. S., aged forty-seven. Referred by Dr. Daniel E. Murphy.

Previous illnesses. Patient had an acute gonorrheal infection about fifteen years before, from which he apparently recovered.

Previous operations. In April, 1919, he was operated upon for a rectal abscess, and in December, 1919, was operated upon for a fistula in ano.

Four weeks before admission to hospital, a no. 26 sound was passed and this was followed by a small amount of periurethritis. Later, several sounds were passed. After the passage of the last sound, patient developed frequency of urination, being obliged to void every half hour during the day and twenty times at night. Two days before admission to hospital, he developed pain located in the rectum and along the urethra. This pain was associated with the act of urination. Complained also of some difficulty in starting the stream. Two days prior to his admission to the hospital patient developed complete retention which necessitated his being catheterized three times. Also had chills and fever for a week before admission. Great desire to urinate but was unable to void.

Examination. Scar from the operation for fistula in ano. A bean-sized lump was seen in the middle of the anterior urethra. Blood examination showed 15,600 leucocytes. Wassermann reaction, negative; gonococcal complement fixation test, positive 4 +.

Rectal examination. Prostate enlarged and the right lobe about three or four times the normal size; the surface smooth.

Abscess ruptured into the urethra two days after the onset of retention. Following the rupture, patient had relief of symptoms and a return of normal urination.

B. streptococcus in the pus expressed from the prostate. No gonococci were found. Blood culture, negative.

ABSCESS OF THE PROSTATE ASSOCIATED WITH BENIGN HYPERTROPHY

When an abscess of the prostate occurs in elderly men without hypertrophy, a diagnosis of benign hypertrophy is made, as a rule, and the abscess is not recognized. When the abscess occurs in elderly men with hypertrophy, the abscess is often overlooked and a diagnosis of hypertrophy is made.

At times the differentiation may be very difficult, and cases have been reported in which the abscess was not recognized until the bladder was opened, this having been done for the purpose of removing a suspected enlargement of the gland.

In one case a diagnosis of hypertrophy was made by the family physician and the presence of the abscess was not recognized. There was no enlargement of the lateral lobes per rectum. Cystoscopic examination showed a small median bar and rectal examination showed an abscess in one lobe. In the second case a diagnosis of hypertrophy was made and found to be present, although the presence of the abscess had not been recognized before the patient was admitted to the hospital. In the third case, beginning enlargement of both lateral lobes and a small bar were demonstrated cystocopically after operation for the abscess.

One of the cases had complete retention of urine, necessitating catheterization every six hours. The retention was present for a fortnight prior to his admission to the hospital.

Case V. J. F., aged sixty-seven.

Previous illnesses. Venereal infection denied.

Present illness. Patient was admitted to the hospital because of complete retention. Had been having more or less bladder distress for about a year, which necessitated voiding from one to three times at night. Frequency very materially increased four days prior to admission to hospital. Two weeks before admission, patient had a chill and was unable to void; sent for a doctor and was catheterized. Since that time, with the exception of two days, catheterization every six hours.

Examination. External genitalia, negative, except for a large hydrocele on the right side. No urethral discharge. Examination of blood showed a leucocytosis of 14,400. Blood pressure: systolic, 136; diastolic 80. Urinalysis: specific gravity 1,020, cloudy, acid; trace of albumin, a few leucocytes, bacteria and amorphous urates.

Rectal examination. Prostate was enlarged, and its apex could easily be reached. Infiltration on the right side, extending to, and apparently filling, the bony pelvis. Prostate was soft in consistence and fluctuation was elicited.

During rectal examination, the abscess ruptured into the urethra. A large amount of bloody pus was obtained.

Examination of the pus showed a pure culture of B. staphylococcus albus.

Case VI. G., aged sixty. Referred by Dr. George Parker.

Previous illnesses. Denied all venereal infection.

Present illness. Patient complained of burning on urination and more or less pain in the urethra. A gradual increase in frequency of urination developed, compelling patient to void every two hours, both day and night. Symptoms gradually increased in severity. About a week later, patient noticed that he had great difficulty in urinating, being obliged to strain a great deal in order to start the stream. The difficulty became rapidly worse until finally there was inability to void and catheterization was necessary.

Examination. External genitalia, negative; no urethral discharge.

Rectal examination. A large, fluctuating mass in the right lobe of the prostate. The abscess was about the size of a plum and bulged into the rectum. Fluctuation could be elicited.

Cystoscopic examination. A well-defined median bar and a beginning hypertrophy of the lateral lobes.

Operation. The abscess was opened through the rectum and patient made an uneventful recovery.

Case VII. J. McG., aged, forty-eight.

Previous illnesses. Venereal infection denied.

Present illness. Patient stated that he had had more or less urinary frequency for ten years, but the frequency was not constant. Complained of intermittent pains in the pelvis and above and behind the symphysis pubis. Some difficulty of urination; at times the stream was split. Two days before entering hospital, patient suddenly developed complete retention of urine which necessitated catheterization.

Examination. External urethral orifice, negative; no discharge. External genitalia, negative. Roentgen-ray examination, negative. Blood examination showed a leucocytosis of 10,000. Wassermann reaction and gonococcal complement fixation test were negative.

Rectal examination. Left lobe of prostate was enlarged; surface smooth and fluctuation elicited.

Operation. A perineal operation was performed and the abscess drained.

Cystoscopic examination. Presence of a notch above, with slightly intravesical protrusion of the lateral lobes and a definite bar at the base.

ABSCESS OF THE PROSTATE ASSOCIATED WITH URETHRAL STRICTURES

One of the patients had suffered from urethral strictures for many years. These had been treated very irregularly with sounds. The passage of sounds gave him a great deal of symptomatic relief which, however, was only of short duration, necessitating the use of sounds every few months. The last sound was passed seven weeks before the onset of symptoms of abscess of the prostate. Undoubtedly, the chronic urethritis and the frequent instrumentation were predisposing factors in producing the abscess.

Lasio has recently reported a case of abscess of the prostate due to stricture.

Case VIII. F. C., aged, thirty-nine. Referred by Dr. Charles Schott.

Previous illnesses. Urethritis in 1898, of four months' duration; treated with irrigations. In 1916, patient had a very severe attack of bilateral B. coli pyelitis. Examination at that time showed the presence of pus cells in the strippings obtained from his prostate. Seven weeks prior to onset of present trouble, patient had a great deal of difficulty in urination, for which sounds up to and including no. 25 French were passed.

Present illness. One week prior to onset of abscess, patient was confined to his bed, because of an attack of left-sided epididymitis. Frequency of urination present since onset of acute epididymitis, and this was associated with difficulty in urination; hence, urination was

very slow and required a long time to empty the bladder. Associated with urination, there was a great deal of suprapubic pain radiating over the lower abdomen. Patient had chills, fever and sweats, and ran a temperature oscillating between 101° and 104°F.

Examination. External genitalia, negative. Right epididymis, negative; left epididymis, very sensitive and enlarged.

Rectal examination. Prostate enlarged to about three times its normal size. In the center of the prostate was a soft area, and in this area it was possible to elicit fluctuation. The rest of the prostate was hard. Both seminal vesicles were palpable.

A diagnosis of abscess of the prostate was made and patient advised to have the abscess opened through the perineum.

During the night the abscess ruptured into the urethra. Following the rupture, a large amount of pus was discharged from the urethra. Temperature rapidly returned to normal and the patient was relieved of his symptoms.

ABSCESS OF THE PROSTATE FOLLOWING APPENDICITIS

Whether or not there is any causal relation between abscess of the prostate and appendicitis, I am not prepared to state. Abscess of the prostate, as a remote complication of appendicitis, is not mentioned in textbooks on general surgery or on genito-urinary surgery; hence, when it occurs as a complication it may be only an incident.

Nevertheless, in view of the fact that the patient, whose case report follows, had an appendical abscess which was opened and drained, necessitating his being in the hospital for nineteen days, and also in view of the fact that urethral instrumentation was not used, and no evidence of acute or chronic gonorrhea obtained, one would be justified, apparently, in assuming that there may have been a causal relation between these two conditions.

Case IX. C. G., aged twenty-eight. Referred by Dr. Dean D. Lewis.

Previous illnesses. Venereal infection denied.

Present illness. Patient was operated upon for acute suppurative appendicitis by Dr. Lewis and the appendix removed. Patient remained in hospital nineteen days and left in good condition. Twelve

days after leaving, he returned, complaining of inability to pass his urine, at which time he was catheterized and the catheter passed quite readily. Went home and returned the next day, because of inability to urinate. At this time a no. 21 French sound was passed and no obstruction found.

Examination. Negative, except for a recent scar in the appendix region. External genitalia, negative. Blood examination showed a leucocytosis of 11,700 and hemoglobin of 90 per cent. Blood pressure: systolic 150; diastolic, 108. Urinalysis: specific gravity 1,020, turbid, amber; albumin, red blood cells, and bacteria positive.

Cystoscopic examination. The cystoscope was introduced into the bladder with a little difficulty owing to an apparent obstruction in the deep urethra. This resulted in the rupture of an abscess with an outflow of a large amount of thick yellow pus. This was followed by an immediate relief of his symptoms.

Rectal examination. Prostate large and very hard. (The examination was made at once.) By applying pressure on the prostate a large amount of pus was seen exuding from the external urethral orifice.

ABSCESS OF THE PROSTATE WITH CALCULI

This combination is a very rare one. Cases have been reported in which the abscess ruptured and a fistula remained. Calculi have been removed through the fistulous opening. Cases of this kind have been reported by Dupuytren, Joshua, Crosse, Baker and Devin. Lydston recently reported 2 cases of stone and abscess of the prostate. In one case he removed a calculus from the abscess cavity; in the second, a perineal abscess developed which was opened by the patient's physician and a stone weighing 700 grains removed.

One case in this series belonged to this group and the calculi were diagnosed at the time of the patient's first admission to the hospital. This case was reported[1] in detail when the patient first came under observation, at which time he was suffering from prostatic calculi. The abscess was a part of his terminal illness.

[1] Herman L. Kretschmer (*Surgery, Gynecology and Obstetrics*, January, 1918, p. 70).

Case X. F. A. K., aged fifty-seven.

Previous illnesses. At eighteen patient had a lesion which was diagnosed as a chancre. Last attack of urethritis, twenty years ago. Patient had occasional attacks of pain in the hypogastrium. Attack of cystitis two years prior to onset of trouble.

Present illness. Patient complained of frequent inability to urinate, frequency of urination, pain after urination and incontinence. Incontinence began four weeks before admission to hospital. Difficulty in starting stream was variable. Sometimes patient could not start the stream at all, and at other times he could only start the stream after sitting down and waiting. The stream was slow, lacked force, and dribbled.

Examination. Pupils, irregular. Finger-to-finger test showed a slight incoördination. Pain sensation diminished in arms, chest, abdomen and legs. Dr. Bassoe saw patient in consultation, and a diagnosis was made of scattered areas of degeneration both in motor and sensory areas, probably dependent upon arterial changes. Blood examination showed 10,200 leucocytes. Blood pressure: systolic, 165; diastolic, 65. Urinalysis: specific gravity 1,005; albumin, sugar and blood, negative; a few granular casts. Wassermann reaction, negative; spinal Wassermann, positive. Cultures of the urine were sterile. Roentgen-ray examination showed the presence of multiple calculi in the prostate. Patient remained in hospital for several weeks and was discharged February 20, 1917.

Patient reëntered hospital, October 31, 1917 and was admitted to the medical service of Dr. James B. Herrick. Complained of shortness of breath, swollen feet, incontinence of urine, and headaches. On the medical service twenty-one days, and died November 20, 1917.

The autopsy was performed by Dr. B. O. Raulston, Pathologist, Presbyterian Hospital. The following post-mortem report is taken from his protocol:

Primary abscess of the prostate gland. This abscess contains thick creamy pus. Pus distended seminal vesicles. Thick pus exudes from the seminal vesicles. The lining of the urinary bladder is markedly hypertrophied; hyperemic, but more hyperemic in the prostatic region. Marked dilatation of the ureters and pelves of the kidneys containing pus. Hyperplasia of the periaortic lymph-glands. Slight edema of the lungs. Marked senile sclerosis of the aorta. Chronic myocarditis. Beginning aortic aneurysm. Bed-sore of the lumbar region.

CASES IN WHICH THE ETIOLOGY WAS NOT DETERMINED

In some cases no apparent cause for the abscess could be found. The usual clinical and laboratory methods of examination failed to demonstrate any possible etiological factors.

It is in this group of cases that not only the adjacent viscera (urethra, rectum, etc.) should be carefully examined, but the possibility of distant foci of infection should be borne in mind.

Various lesions of the rectum, such as fissures, fistulæ, abscess, ulcers, hemorrhoids, etc., have all been mentioned as factors in the production of prostatic abscesses.

Recently, attention has again been called to the rôle of rectal lesions in prostatic abscess, by Brooks, Wilson and McGrath, Motz and Vogel.

The possible rôle of distant foci, as an etiological factor, has undoubtedly not received as much consideration as it should. In this group of cases, careful examination should be made of the teeth, tonsils, and sinuses, as a routine. The case mentioned in the first part of this paper, in which the prostatic abscess developed after an acute attack of tonsillitis, seems to be of more than passing significance.

As an example of this group, the following will serve as an illustration:

Case XI. Wm. K., aged forty-eight.

Previous illnesses. Venereal disease denied. In 1913 patient had an attack of appendicitis. In 1914 he had an attack of right-sided renal colic, at which time many blood cells and casts, it is stated, were found in the urine.

Present illness. The present illness was sudden in onset and began with indefinite abdominal pain, general at first; later this was localized in lower abdomen. The entire abdomen was sore. This was followed by severe burning in and along the urethra. Patient said that he felt as though he had obstruction to urination and that it was necessary to urinate every half-hour to one hour at night; only a small amount of urine was passed each time. There was some interruption of the stream; and although the amount of urine voided each time was very small, the stream was often interrupted before the act was completed. When seen by his family physician, patient had not voided for six

hours. Had had severe pain in the rectum and defecation was very painful. A diagnosis of retention was made by his physician; a catheter was passed, but the bladder was found to be empty.

Examination. External genitalia, negative; no evidence of acute or chronic urethral discharge. Roentgen-ray examination, negative. Wassermann reaction, negative. Examination of blood on October 3, 1919, showed 11,800 leucocytes; October 5, 30,000 leucocytes; October 15, 9000 leucocytes.

Rectal examination. An enlargement in the left lobe of the prostate, which was very painful to touch. Fluctuation could be elicited.

The abscess ruptured into the urethra.

Examination of the pus showed the presence of staphylococci and streptococci.

For purposes of discussion, the cases falling into this category may be divided into the following three groups:

Group 1. An important point to remember in connection with abscess of the prostate is that the clinical picture may be that of general sepsis, masking or over-shadowing the prostatic symptoms to so great an extent that the true nature of the patient's illness is not discovered until late in the course of the disease, and a diagnosis of general sepsis is made. At times a diagnosis of typhoid, chronic malaria, etc., is made. A case of this type was reported by Brooks in which a diagnosis of paratyphoid was made but not proved. The onset of painful defecation in about the third week of the patient's illness led to a rectal examination which revealed the presence of an abscess of the prostate.

Group 2. Under this heading may be considered cases of abscess of the prostate in which the abscess is part of a general sepsis and in which evidence of general sepsis is present. The case to be reported below seems to belong to this group.

Group 3. General septic infection may have its origin from suppuration of the prostate. A case belonging to this group has been reported by Rössle:

The patient had been kicked by a horse; the spleen was ruptured. There was an exudate in the splenic area, and after aspiration, fever and retention of urine set in. A perinephritic abscess was drained. Death occurred seven weeks later, from general sepsis. The autopsy

revealed suppuration of a subphrenic hematoma; healed rupture of the spleen; embolic abscesses of both kidneys. The oldest pus focus was found in a complete suppuration of the prostate.

As an example of an abscess of the prostate, associated with general sepsis, permit me briefly to mention the following case:

Case XII. M. H., aged forty-five. Admitted to hospital in a semi-comatose state.

Previous illnesses. Venereal disease denied.

Present illness. Four years ago, patient had an attack of retention of urine. Frequency of urination began eight months ago and has been present ever since, patient being obliged to urinate every two hours, both day and night. In all, he has had eight or nine attacks of retention. Some of these were relieved by the use of hot baths and hot applications. Last attack, four days ago, relieved by hot baths. Last catheterization five months ago. Was catheterized only once with a soft rubber catheter and that went in with difficulty. Urgency of urination is very marked and the patient has no power to withhold the impulse of urination when it occurs; hence, the wearing of a rubber urinal is necessary.

Examination. Patient is very sluggish mentally: answers questions very slowly. Exploration of the urethra reveals the presence of many strictures in the anterior urethra. Hemorrhagic spots on the skin. No discharge. External urethral orifice and scrotum, excoriated.

Roentgen-ray examination of the genito-urinary tract, negative. Examination of blood shows 15,500 leucocytes.

Patient's mental condition rapidly became worse; more and more drowsy. Death occurred three days after admission to hospital.

Permission for a complete autopsy could not be obtained. Autopsy revealed the following findings:

The spleen was enormously enlarged and showed the presence of many infarcts (chronic septic spleen). Liver was negative. Both kidneys indicated the presence of a very severe hemorrhagic nephritis; many recent infarcts. An abscess was found in the prostate and there was a very large abscess around the prostate.

Many ecchymoses of the skin.

From the autopsy findings it seemed justifiable to assume that the patient was suffering from a general sepsis and that the abscess in and around the prostate was a part of his general sepsis.

SYMPTOMS

Once the abscess has developed, there does not appear to be any difference in the symptomatology in the venereal and non-venereal cases, except as regards the presence of an acute or chronic discharge. An analysis of the more common symptoms shows that they were present in both groups. For this reason they will be considered together.

Frequency of urination. This was present in 34 of the 43 cases. Although the most constant of all urinary symptoms present, frequency of urination varied greatly in its intensity in the individual case. Thus, where in some cases there was only a slight increase in frequency, in others it was so well marked that the patients were obliged to void every two hours, both day and night. In 7 cases the patients were obliged to void every fifteen to thirty minutes, both day and night.

Pain. Pain in one form or another was almost constantly present. Thirty-six of the 43 cases had pain. In some the pain, which was suprapubic, was present only when the bladder was distended; relief came promptly with catheterization.

Perineal pain was present in 11 cases, and in 14 cases, the statements made indicated perineal fullness associated with pain.

Pain, associated with or aggravated by micturition, characterized 22 cases. In some the pain was present before, and in others both before and after, urination. In some the pain was in the neck of the bladder, and in a small number it was referred to the lumbar region.

Retention of urine. In 14 cases in this series complete retention of urine occurred; hence, catheterization before or after admission to the hospital was carried out. Practically all 14 cases came to the hospital seeking relief from retention. The duration of the retention was variable. In one case retention was present for a fortnight prior to admission. This was the longest duration of retention in this series. The following duration was noted in the remaining cases: eight days—1 case; seven days—3 cases; three days—1 case; two days—4 cases; one day—1 case; twelve hours—1 case; and in 2 cases the catheter was

used only once. Of these 14 cases, 8 instances of retention were complications of gonorrhea and the remaining 6 occurred in nonvenereal cases. In these 6 cases, the retention occurred under the following circumstances:

1. Previous operation for appendicitis.
2. Osteomyelitis of finger.
3. Carbuncle of neck.
4. Passage of sounds.
5. Benign hypertrophy.
6. No cause found.

Difficult urination. Synchronously with an abscess in the prostate there occurs a definite enlargement. As a result of this, one would naturally expect some difficulty in urination in a certain number of cases. In this series there were 23 cases in which this difficulty was more or less characteristic.

Rectal symptoms. These symptoms occurred in 25 cases and were described as painful defecation in 10 cases. Pain in the rectum was a distinguishing element in 11 cases, and abnormal sensations, such as a feeling of warmth or fullness, were complained of in 2 cases. Ten cases were free from rectal symptoms. In 9 cases no record of the presence or absence of rectal symptoms was noted.

Of the 25 cases presenting rectal symptoms 20 were due to abscess of gonorrheal origin and 5 were nonvenereal.

Chills and fever. Nineteen cases were subject to these disturbances.

Rectal findings. In all the cases definite changes in the prostate were elicited upon rectal examination. In each case rectal examination gave evidence of pain and tenderness in the prostate as well as changes in size and consistence.

In the well-advanced or well-developed cases of abscess, the diagnosis is easy. In the early cases, in which the abscess is small, that is, before there has been much destruction of prostatic tissue, there may be some doubt about the diagnosis. In several cases the presence of a definite circumscribed area of pain and tenderness was of assistance as regards recognizing the cases early and permitting early surgical intervention. When the abscess is large, fluctuation can readily be elicited.

In 13 cases rectal examination revealed the location of the abscess in the left lobe, and in 10 cases in the right lobe. In the remaining cases no specific reference to one lobe or the other was noted.

COURSE

The three possible terminations of an abscess of the prostate are (1) resolution, (2) rupture, (3) operation.

One case left our observation after the diagnosis was made and further data was not obtainable. Two cases were found at autopsy.

1. Resolution

In this series there were only 4 cases that went on to resolution. Thus it will be seen that the total number of cases that go on to resolution is small.

2. Rupture

In 19 cases the abscess ruptured into the urethra. The factors which were associated with rupture were variable. Some ruptured spontaneously, or while straining at stool; some without any apparent factor being present as the cause; and others during rectal examination, although the examination was made very carefully and without exerting undue force.

In several instances the amount of pressure exerted by the finger in the rectum was increased in order purposely to cause the abscess to rupture into the urethra. Needless to state, this is not practiced or recommended as a routine procedure.

In 1 case the abscess pointed alongside the rectum; hence, it might easily have been mistaken for an ischiorectal abscess.

When an abscess of the prostate points alongside the rectum or when it appears above the symphysis pubis, it should no longer be considered a true abscess of the prostate. Some authorities are of opinion that this sort of abscess is a periprostatic suppuration or phlegmon, but most authorities call it a periprostatic abscess.

Averseng and Dieulafoy have made exact anatomical, experimental and pathological studies upon the site and upon the sheath-investing membrane of the prostate, and, according to their findings, have demonstrated that besides the prostatic capsule, as they call it, there is a periprostatic aponeurosis, arranged in such manner that interspaces are formed in front, laterally, and behind the prostate, which are of great importance, since they may be the seat of isolated abscess formations. According to these authors, true periprostatic abscesses lie within the prostatic aponeurosis, between the latter and the prostatic capsule, and originate through direct contact with suppuration of the gland. Abscesses situated outside the aponeurosis in the cavum retzii, in the perirectal space, etc., arise from extension of infection by way of the lymphatic vessels and the veins. They do not form encapsulated abscesses, but appear as diffuse phlegmons. These anatomical relations point to the necessity, when opening a periprostatic abscess, of making sure that no other encapsulated abscesses are present in the interspaces above described."

Blum reports 1 case in his series in which the abscess appeared an an enormous tumor over the symphysis, simulating a distended bladder.

3. Operation

Sixteen cases were operated upon. No operative deaths were recorded in those cases in this series in which incision and drainage were the treatment.

One of the abscesses was opened through the rectum by the local physician; the abscess was very large and protruded into the rectum; hence, it was a simple procedure. Formerly, this route was the one resorted to very often and very freely; at present it is rarely, if ever, used. The patient made a prompt recovery and there were no unpleasant sequelae.

As mentioned above, one of the abscesses pointed in the ischiorectal fossae. This was opened by an incision alongside the rectum, just as in any other ischiorectal abscess.

The remaining 14 cases that were operated upon were subjected to the perineal operation. At the present time, this is certainly the popular route for the operative treatment of abscess of the prostate. Care should be exercised, after opening the abscess, to insure thorough drainage; that is, to preclude the possibility of another abscess being left behind. To this end the septa between the abscesses should be broken down with the finger.

If the abscess is located only in one lobe, that particular lobe, and no other, is opened. If both lobes are the seat of an abscess, both are incised at one sitting.

The treatment of abscess of the prostate does not differ from the treatment of an abscess in any other organ, where the dictum is to make the diagnosis early and to drain.

Perhaps the policy of watchful waiting has been instituted and encouraged, because a large number of cases tend to rupture into the urethra, if one waits long enough. This delay—waiting for something to take place—must necessarily be at a certainexpense of the prostate; for if our object is to conserve the functions of this organ, it would appear the right sort of treatment to make the diagnosis early—namely, before much destruction of gland tissue has taken place and then to institute proper surgical intervention. Futhermore, spontaneous rupture may, at times, be insufficient for proper drainage; hence, an infected cavity remains which may be the cause of a chronic discharge or of subsequent attacks of abscess formation.

One case developed epididymitis after the operation, and another, an urethral fistula on the third day after the operation. This was entirely healed at the time the patient left the hospital.

One factor which seems to be of sufficient importance to discuss, is the importance of the after-care of the patient after the abscess has healed. Our method has invariably been not to dismiss the patient as cured because the abscess was healed.

Careful massage of the prostate followed by microscopic examination of the strippings revealed the presence of pus. In view of this fact, it would appear important that these patients should be carried through to a point where the prostatic strippings are

free of pus. This has been our routine—at least, we have attempted to carry it out whenever we were able to get the patient to cooperate with us.

Our duty toward a patient is not fulfilled, and remissness obtains, if we allow him to leave so long as the prostatic strippings still show pus. At times, one meets a patient who is surprised to learn that further treatment is necessary after the operation,—a procedure which is not readily understood by him, since he regards the operation all that is necessary to effect a cure.

SUMMARY

1. Abscess of the prostate occurs more frequently than is generally recognized.

2. Infected abscess cavities, which drain poorly and have ruptured into the urethra, may occasionally be factors in keeping up a chronic urethral discharge, or they may lead to recurring exacerbations of attacks of acute prostatitis.

3. Nongonorrheal abscess is not an uncommon occurrence.

4. Early surgical intervention—namely, incision and drainage, is a rational method of handling these cases and does not differ from the surgical treatment of abscess occurring in other organs.

5. Operative treatment doubtless shortens the duration of the disease.

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SARCOMA OF THE PROSTATE

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We report the following case with a digest of the literature on sarcoma of the prostate in the adult. First, because of the comparatively few reports to be found in the literature. Second, that in so far as we have been able to ascertain there has been no case reported in a man of the advanced age of our patient.

W. H. C., aged seventy-one years, was referred October 31, 1919. His chief complaint was that of dysuria and frequency accompanied by symptoms of urinary obstruction. He had been losing flesh for about six months and had periodic attacks of gastro-intestinal disturbance. Reference of Mr. C. to the gastro-enterologist and the neurologist failed to lead to the discovery of any gastro-intestinal or neuropathology that could be ascribed as the cause of the emaciation or the gastro-intestinal symptoms. Blood examination and Wassermann test were negative. Urological examination showed by rectal palpation an enlarged and soft prostate. The urethral length was increased to 25 cm. No obstruction was met in passing a no. 20 F. soft rubber catheter. There was 120 cc. residuum and the bladder capacity was 200 cc. Cystoscopic examination showed a large uniform intra-vesical prostatic outgrowth, a generalized cystitis and trabeculation. The ureter openings were not seen and as the examination was painful no prolonged attempt was made to find them. Personal circumstances prevented an immediate hospital admission for prostatectomy, so palliative treatment was instituted until he entered the hospital on January 23, 1920. Within twenty-four hours after admission to the hospital Mr. C. developed a pneumonia which further delayed operation. On February 14 an attempt at suprapubic prostatectomy was made. Upon introducing the finger into the urethra to start enucleation, it was obvious that something different from the ordinary was being encountered as there was no line of cleavage and the substance of the growth was so friable that it had to be removed as best we could with a gall bladder scoop and flushing. Enough pieces were gathered to

send to the Laboratory, and the following report from the pathologist is presented.

"Report of examination of several small fragments of whitish friable tissue, the largest about 4 mm. in diameter. The larger fragments composed of closely packed small round mononuclear cells with an occasional cell of large size with more cytoplasm with very small amount of connective tissue scattered through the growth in small fibers and short trabecular-like masses showing no definite arrangement. Some of these masses partly surrounded with loosely formed connective tissue walls infiltrated with the round cells. Poorly outlined blood vessels appear in the growth and a few atrophied gland tubules are visible in some of the fragments. Characteristic structure of round cell sarcoma."

Mr. C's convalescence from operation was uneventful. His suprapubic wound closed and normal urination became established in three weeks. He was discharged from the hospital March 10, 1920. By the "follow up" his physician advises me that "while Mr. C. has no urinary symptoms and no evidence of trouble with the wound, his general condition is not good." We will continue a "follow up" on the case and report ultimate result at some future date.

A sarcoma in the prostate may start primarily or may transplant itself from the testicle or elsewhere. The small round celled form appears to be the most frequent. H. A. Royster's (1) statement that they often result from injury has been challenged by Schepelmann (2), who lays down the dictum that "there is no possibility of a neoplasm having been caused by injury, if the interval between the accident and the development of the tumor is more than three or four weeks.

One of the earlier seemingly well authenticated cases has been recorded by Coupland (3). The subject was a man, aged 29, with a "lymphosarcoma." However, J. Ewing (4) doubts the existence of lymphosarcoma as described by Coupland, as the structure of the gland does not favor the occurrence of such tumors.

Wharton (5) has put on record the case of a man, aged fifty-five, with retention of urine. The patient died on the ninth day after operation. Postmortem revealed a round celled sarcoma of the prostate.

A case quite similar to that of Wharton has been reported as early as 1873, by Socin (6), regarding a man, aged fifty-one, who died of septicemia, five weeks after catheterization had been instituted.

West (7) reports the case of a man, aged twenty-one, with difficult micturition. The disease took a rapid course. Autopsy showed a large tumor composed of small round spindle cells. H. Hill (8) has seen the specimen from a man, aged sixty-four, who had died suddenly after suppression of urine for ten days. There was a growth consisting of an abundant stroma of fibrous tissue, containing large numbers of spindle cells.

C. L. Gibson (9) reported the case of a man, aged thirty-five, who four months previously had been operated on; the portion removed was a small round cell sarcoma of the prostate. However, the tumor grew rapidly and four months after the first operation rectal examination showed a mass the size of a fist occupying the prostatic region. Combined suprapubic and perineal operation was followed by death from exhaustion.

A second case reported by Gibson (10) was that of a man, aged thirty-six, admitted for urinary trouble. An irregular mass replaced the prostate. The growth of the tumor was very rapid. The patient died of exhaustion. Microscopic examination showed a round cell sarcoma, moderately vascular. Gibson reported the above cases to this Society in 1904 and 1909.

Charles H. Powers (11), in 1908, was consulted by a man, aged sixty, for rapidly increasing difficulty in urination. Rectal examination revealed a very large, rounded, slightly nodular prostate. He succumbed on the fifth day after the operation. Examination of the masses removed showed a small round celled sarcoma of the prostate. In reviewing the literature, Powers considers this form as the most frequent, and the condition occurring most frequently in childhood.

Analyzing the cases tabulated by Powers (9) and Proust (12), and eliminating those in the latter's tabulation not accepted as authentic, up to the year 1907 we have thirty-three cases. To these must be added a case report by Cabot (13) regarding a man, aged 75, with a small spindle cell sarcoma; and a case

described by Bobbeo (14). Moreover, Depage (15) successfully removed a prostate from a man, aged twenty-five. Microscopic examination showed a small round cell sarcoma.

In 1909, J. R. Eastman (16), reported the case of a man, aged twenty-seven years, with a spindle celled sarcoma of the prostate apparently running a course covering five years. Eastman believes that sarcoma of the prostate is less rare than had been imagined, owing to the circumstance that until recently very little distinction had been made between carcinoma and sarcoma. Pouchet (17) reiterates the fact that sarcoma in adults is rare.

Newman (18) reports the case of a man, aged thirty-five, with retention of urine following an injury. The entire prostate was found occupied by a growth which proved to be a round celled sarcoma. One of the important features in this case was the primary existence of a small, well encapsulated sarcoma of the prostate, which had given no symptoms before the injury to the perineum when the rupture permitted the rapid growth of the neoplasm.

The common symptoms, besides the presence of the tumor, are dysuria, retention, hypogastric and perineal pain. The treatment is symptomatic and palliative. J. P. Warbasse (19) urges enucleation. Others recommend radium treatment at the earliest moment. Pfahler (20) claims X-rays will cure the majority of cases. Deaver (21) calls attention to the rapid growth of sarcomata.

The New York Medical Journal (22), editorially, dwelling on the malignancy of prostatic sarcoma, points out that, the neoplasm growing in the adult less rapidly than in children, operation offers more chance of success. Early diagnosis is important; in elderly subjects, disturbances of micturition and the appearance of a tumor in the hypogastrium and perineum leading to the phenomena of cachexia should cause suspicion.

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DISCUSSION

THE PRESIDENT: Dr. Keyes had had a great deal of experience with cases of prostatic abscess, and I am going to ask him to open the discussion on Dr. Kretschmer's paper.

DR. E. L. KEYES, JR., New York, N. Y.: We see many cases of prostatic abscess in Bellevue Hospital, and have not been very well satisfied with the results of the traditional methods of operation. We have therefore tried out some new methods. Before speaking of the treatment, however, permit me a few words about the diagnosis.

In the first place, these abscesses occur only in those portions of the prostate that are subject to hypertrophy. I have never seen an abscess in the posterior lobe. In the second place, as Dr. Kretschmer suggested, it is not always possible to distinguish a prostatic abscess that has ruptured into the perineal space from an ischio-rectal abscess.

An abscess from the rectum may point in the median line in front and yet have no relation to the urinary organs. An abscess from the prostate may open at right angles to the rectum laterally and yet have nothing to do with the rectum.

Furthermore, we have found some difficulty in diagnosing these acute abscesses of the prostate from tuberculous abscesses, which Dr. Kretschmer did not mention in his paper. We have not always found it easy to make the diagnosis, and sometimes operate upon abscesses supposed not to be tuberculous, which do not heal, and the diagnosis of tuberculosis is subsequently made by biopsy.

A rather extraordinary type of case was one of a patient who came into the hospital suffering from rheumatism. He had some pus in his urine, and the hospital authorities are always glad to attribute such cases to gonorrheal rheumatism and send them to us. He was sent to our service. We did not find he had

gonorrhea, but we did find some swelling of the prostate and seminal vesicles, and accordingly I started to do vesiculotomy. In the course of operation I opened a small abscess in one of the lateral lobes of the prostate by means of a suture which was employed to pull the prostate down. I incised both lateral lobes and from one of them obtained a good deal of pus. The patient was cured of his rheumatism; he was not cured of his operation. His fistula remained open, and was later proven tuberculous.

Coming to the question of the operation itself, I quite agree with Dr. Kretschmer that you get into all manner of difficulties if you open prostatic abscesses into the urethra. We have performed that operation many times; we have also opened prostatic abscesses suprapubically, as suggested by Dr. Lilienthal. None of these procedures has given particular satisfaction. They bleed a great deal; they may get septic. On the whole, the technic Dr. Kretschmer advises is good, excepting that it is possible sometimes to get away with less of an operation, and also you can never be absolutely sure the abscess is not about to rupture into the urethra during the course of the operation, with the resulting inconvenience of a urethro-perineal fistula.

Dr. Kretschmer said the opening of prostatic abscesses into the rectum had been practically given up. As far as our own practice is concerned, I would have conceded that two or three years ago, but in the last year we have opened three or four prostatic abscesses into the rectum because they bulged markedly, with a soft spot at the point of maximum bulging.

The convalescence of these cases is prompt and immediate. I have never seen any inconvenience whatever. They leave the hospital in a few days. I have opened extremely large prostatic and periprostatic abscesses through the anterior rectal wall.

Dr. Kretschmer mentioned a case in which a prostatic abscess complicated appendicitis. I might mention a case in which appendicitis complicated a prostatic abscess. I think it was an accident or incident in either case. A very large prostatic abscess was opened into the rectum, a pint or so of pus squirting out from the anus. The patient immediately recovered, left hospital in three days, remained well for three weeks, and returned

to the hospital with a gangrenous appendicitis and peritonitis from which he died. I do not know that the two conditions had any relation to each other.

For the routine treatment of prostatic abscess two new types of operation have been devised and both have proven quite satisfactory. Dr. Stevens has simply put a sound into the urethra and a finger into the rectum and turning the sound to one side has plunged it into the prostatic lobe on that side, and then turning it to the other side has plunged it in there, washed out the bladder, and then let the patient go. There have been no complications from twenty cases treated that way except one, who developed a large pelvic hematoma, which was, of course, infected. It was drained through the groin, and urine discharged through the sinus for about a week. The patient got well. The other cases have all done well and leave the hospital within a week.

Dr. Barringer has developed a technic for aspirating the abscess through a "spiral puncture" needle, inserted into the perineum, under local anesthesia, and under the guidance of a finger in the rectum. With this operation he has relieved 15 out of 16 cases whose pus was confined to the prostate. In a couple of cases he has tried this procedure for periprostatic abscess, and one of these abscesses he cured. The other cases had to be opened subsequently. In one case in which he failed, the abscess was due to staphylococci.

To sum up: during the past year all cases of prostatic abscess complicated by fever or by retention of urine have been treated by the methods of Drs. Barringer and Stevens. These have proven equally successful. Patients who had residual urine before the operation got rid of it. Only one of them had to be catheterized once or twice thereafter; and they went home in a satisfactory condition in a few days. Most of them were gonorrheal.

Large periprostatic abscesses have been treated by perineal drainage, with such subsequent operation as the fistula may require, or by puncture through the anterior rectal wall.

DR. A. H. CROSBIE, Boston, Mass.: The essayist spoke of the use of the indwelling catheter in cases of prostatic abscess in which there was acute retention. It has been my experience in a great many cases the indwelling catheter produces a good deal of irritation of the bladder outlet, and I have generally found that such cases did better with catheterization at intervals.

DR. H. L. KRETSCHMER, Chicago, Ill. (closing the discussion): I think perhaps I did not make my point clear about the use of the indwelling catheter. I did not read all of that particular patient's history, but the indwelling catheter was used before the patient came to us, and was one of the cases that had hypertrophy. We do not recommend the use of the indwelling catheter in cases of prostatic abscess.

Dr. Keyes said that in some of the cases that he has had the abscesses were of tuberculous origin. We have not had in this series any case of tuberculous abscess.

The case in which opening the abscess through the rectum was advised, showed the presence of a very large abscess which bulged into the rectum and this procedure was easily carried out, and the patient made a prompt and uneventful recovery. The rest of the cases that were treated surgically were opened through the perineum and not through the rectum.

PROBLEMS CONCERNING URINARY CALCULI

EDWARD L. KEYES, JR.

Urinary calculi consist of agglomerations of nonacicular crystals about a nucleus of organic matter. Concentration of the urine, in the presence of pus or blood due to trauma or disease, must be the occasion of stone formation. But with the exception of the secondary calculi, obviously due to inflammation, this bare fact has not elucidated the cause of stone. One would expect that trauma to the kidney should be a frequent cause of bleeding calculated to result in stone. Yet such does not seem to be the case. Prize fighters are not notoriously subject to stone, and in reviewing a series of some 200 cases of primary renal stone I find but five in which the symptoms of stone began within a few years after a trauma.

It is more profitable, then, to accept the fact that stones do begin, and to study the clinical features they present that seem to bear upon their origin.

Most primary stones contain both urates and oxalates. But in contrasting bladder and renal calculi we are immediately struck with the predominance of urates in the stones found in the bladder and the predominance of oxalates in renal and ureteral stones. By the same token the former frequently fail to show by X-ray, while the latter are but rarely overlooked. Thus in a consecutive series of cases in which stone was present the radiographic results were as follows:

	POSITIVE	NEGATIVE
Renal pelvis	32	6
Ureter	20	14
Bladder	16	12

Most of the failures to show ureter stones are attributable to the small size of the stone, and many of the successful pictures of bladder stones to the presence of phosphates.

Bladder stones are disproportionately frequent in childhood, corresponding with the predominance of urate deposition in the urine of the young, while adults show a more marked tendency to the urinary precipitation of oxalates.

A majority of the urate stones retained in the bladder have no antecedent history of renal colic. Does this mean that urate stones more commonly form in the bladder, while oxalate stones more often form in the kidney pelvis? Probably not. Let us not forget that the Urologist is not really concerned with stone as such, but only with such stones as fail to pass from the urinary channels, or in passing excite symptoms. Many very small stones doubtless pass silently. We are interested only in those that grow so large they cannot do this. And this means retention.

We can think of four ways in which a stone may be retained in the urinary channels, viz.,

1. The stone may adhere to its point of formation until too large to pass.

2. It may be irregular in shape and thus peculiarly liable to catch in ureter or urethra.

3. It may lie in some part of the kidney pelvis or bladder where it does not present at the ureteral or urethral orifice.

4. There may be ureteral or urethral obstruction (e.g., stricture).

1. *Adhesion to the point of origin* may be actually observed in the case of secondary bladder stones. A similar process may delay the discharge of certain primary renal stones, for sometimes we recover small oxalate stone (after they have passed noisily down the ureter) which show a cup shape, as though they had remained for some time adherent to the tip of a renal papilla —indeed such adhesion has been observed post-mortem.

2. Comparison of the size and shape of stones passed after renal colic with the difficulty of their passage will confirm the rather obvious assumption that *it is the shape rather than the size* that determines the likelihood of the stone being temporarily or permanently impacted in the ureter.

Is not this the reason why we, who are interested only in impacted or retained stones, find oxalates predominating in the upper and urates in the lower urinary channels? It would seem

so. At least I know of no change that the urine undergoes in passing from kidney to bladder that would make it more likely to form urate stones in the latter, while the smooth urate stone may certainly slip silently down the ureter that would react in violent spasm to the passage of a jagged oxalate stone even smaller in size. But once the stone reaches the bladder the probabilities are reversed. Here the very roughness of the oxalate stone facilitates its discharge by exciting violent contractions that no smooth stone would evoke.

3. *Retention* explains several facts in relation to stone. The silent stone filling the kidney pelvis has had its beginnings as a small stone lying in one of the lower calyces until it has grown over the orifice of the ureter. Such silent stones are also found in the bladder and even in ureter and urethra. In the bladder they imply at least a little retention of urine (perhaps the same is true of the kidney), and in the narrow passages the silent stone is usually found behind a stricture.

By means of the X-ray I have watched the growth of a secondary renal stone (whose rate of growth is much more rapid than that of a primary stone) in seven years from a maximum diameter of 0.5 cm. to 5 cm.; and in my precystoscopic days I watched a patient, who suffered only from a slight hematuria when he rode horseback, for three years before the X-ray revealed two stones in his bladder, each of them 3 cm. in its smallest diameter.

In the ureter I have known a stone to cause a frightful colic and then remain entirely silent for five years. Another ureteral stone (following trauma to the loin) produced attacks of pain of varying severity for fifteen years (approximately) and thereafter for twelve years only hematuria when the patient rode horseback. Another grew to be 1 cm. long, yet never gave a symptom.

In the urethra I have known a stone to grow (behind a tight stricture) to a size almost that of the last joint of the thumb without exciting a symptom of which the patient was willing to complain—indeed, he entered the hospital for the treatment of rheumatism, and his urinary condition was disclosed by the routine examination.

Perhaps the best testimony to the influence of retention upon stone is the fact that I have never seen a primary stone retained in the bladder of a woman, and but one in the female urethra.

RENAL COLIC

The following table collected from my case records shows the age at which the first colic or pain proven due to ureteral or renal stone was felt.

Age at first colic	*Cases*
Birth to 10 years	6
11 to 15 years	1
16 to 20 years	13
21 to 25 years	21
26 to 30 years	30
31 to 35 years	28
36 to 40 years	32
41 to 45 years	20
46 to 50 years	21
51 to 56 years	17
57 to 60 years	7
61 to 65 years	3
66 to 70 years	0
71 to 75 years	2
Total	201

This table may be roughly summarized by the statement that only one in ten of the patients began to have renal colics before the age of twenty, yet one-half had begun before thirty-five; the peak is between the ages of twenty-six and forty; the odds against beginning to have renal colic after the age of fifty are about 20 to 5.

These statistics were gathered from 244 patients proven to have urinary stone, presumably primary in the kidney. In 225 there was evidence (pain) that the stone had originated in the kidney pelvis. There were only 11 cases of "silent" stone (two bilateral), 3 with only mild pain and bleeding, and five with toxic symptoms exclusively.

Having a distinct impression that the mobility of the right kidney should make renal colics definitely more frequent upon

the right side I was disappointed to find, after tabulating 178 cases, that 90 occurred upon the left and 88 upon the right side. The statistics of Brassch and Cabot confirm this observation.

But we are more immediately interested in the practical questions relating to renal colic. When a stone jams in the ureter, what is the best method of relieving the colic and of expediting the passage of the stone? How shall we know that the stone will not pass? And if the jam is thus permanent, in what portion of the ureter is it most likely to occur?

There seems to be a general impression abroad that colic expedites the passage of stone through the ureter. At any rate we commonly speak of the passage of stone following a colic. Yet, considered as a mechanical proposition, a renal colic is rather the outcry of the outraged, overdistended urinary channels than a coordinated effort to expel a foreign body. It may conceivably benefit the sufferer little more than a cramp in the leg does a swimmer. It would be more accurate to look upon the cessation of colics as the evidence of the passage of stone. Commonly the stone seems to leave the ureter with a colic, but close observation will bring to your notice many instances in which the stone leaves the ureter without a colic. I have observed two very striking examples of this, in each of which the stone passed without colic, and indeed under conditions that precluded the possibility of colic. And these stones were above the average in size.

Case I. The patient was a stout middle-aged Russian who had paid as little attention as possible to the renal colics from which he had suffered for several years. Finally in one of these his infected renal pelvis ruptured, but even then he did not call a physician until he was so nearly dead from sepsis that the first surgeon summoned to his bedside deserted him with the cheering information to the family that the patient would be dead by morning. But the infection was an acute one and the patient sturdy. I drained his loin, he recovered and is alive and at work today, though suffering from renal insufficiency, it being now fifteen years since the operation. But the startling feature of his case is that on the fifth day after operation, he passed from his bladder a stone, 1 by 2 cm. in diameter. The kidney was draining

freely into the loin at the time and he had not the least ureteral pain to announce the passage of the stone, though it passed through the urethra with some difficulty.

Case II. A similar one. I was called out of town to operate upon a man who after a single renal colic had been in calculous anuria for several days. Bilateral simultaneous nephrotomy drew several stones from the renal pelvis. The right yielded only urine under great pressure. It was deemed safer not to attempt any further exploration. Yet on the sixth day of his uneventful convalescence he passed a stone about 0.5 cm. in its smallest diameter and without any ureteral colic. Subsequent radiograms were negative and he had no further symptoms of stone in the two years that elapsed before I lost sight of him.

Since these two cases called my attention to the possibility of the passage of ureteral calculi without pain I have confirmed the observation several times.

Case III. Thus last summer I took charge of a woman who, having lost her right kidney the year before (nephrectomy for stone), had been in bed for several weeks suffering from urinary septicemia, with recurring chills and fever and loin pain of considerable severity. I promptly transferred her to hospital where the X-ray revealed a small stone at the lower end of the left ureter. I thereupon by abdominorectal palpation felt the stone and endeavored to dislodge it. Neither she nor I believed I had accomplished anything, but when I visited her next day her temperature was down, the loin had ceased its grumbling, and she assured me that she felt the stone in her bladder. The following day she passed it. She remains well today (a year later).

Such observations as these suggest that a stone—even a large stone—may pass from the ureter without colic. They also suggest as previously stated, that the colic is comparable from various points of view to the cramp in the leg of a swimmer.

What, then, should we do in the presence of renal colic? Kill it. I have tried to do this with various of the substitutes for morphine. None of them has given me any satisfactory results. General anesthesia is the only competitor. I have no reluctance about giving the drug freely. One of my internes took 25 minims of Magendie's solution one night before he got rid of his renal colic; and he seemed little the worse for wear the following day.

In short I advocate the administration of morphin, not out of sympathy for the patient's suffering, but because it relieves the spasm that is surely doing little good, may do harm, and without which the patient can perfectly get rid of his enemy.

Among the mechanical aids to the passage of ureteral stone I cannot name one for which I have any very great preference. If the stone is at the lower end of the ureter I always attempt to help it along by recto-abdominal manipulation, and have thus twice delivered stones into the bladder. I have had no success with the various fluids recommended for injection into the ureter, and the only ureteral operation that has shown any promise in my hands is one I hesitate to recommend, it seems so fantastic. If the stone is arrested near the lower end of the ureter, even though it be several cm. from the bladder orifice of the canal, I believe its ultimate expulsion is expedited by cutting open the ureteral orifice with the cystoscopic scissors or forceps. The ureter catheter itself of course occasionally dislodges a stone. I believe that I have eight times expedited the passage of ureteral stones by mechanical measures.

How shall we decide that a stone is permanently lodged in the ureter? This, the most important of all the problems in relation to the surgery of ureteral stone, cannot be answered categorically.

Case IV. I was once consulted by a patient who was most anxious not to be operated upon for six months, although the X-ray had shown a small stone in the upper part of his right ureter. His only colic had occurred the week before. It seemed possible that the stone would pass, and inasmuch as the ureter catheter not only verified the location of the stone, but also showed that the kidney was not infected and was functioning as well as its fellow, I felt justified in countenancing the delay, leaving him in the hands of his brother, a physician. The next news I had of the case was three months later, a telephone message at 1 a.m. stating that after a colic of five days' duration he had ceased to urinate. I found him delirious, febrile, anuric. Incision of the loin revealed an impacted stone, a ureter so gangrenous that it ruptured as I picked it up and a large perirenal collection of urine and pus. I ventured to do a nephrectomy and the patient was fortunate enough to recover, though he lay desperately septic for many weeks and did

not leave the hospital for three months. In the five years since operation he has passed a stone from his remaining kidney, and he is now suffering from chronic nephritis and high blood pressure.

In this connection it may be worthy of note that the ureter may be obstructed by crystals, there being no actual stone formation. The type of renal colic that follows a good dinner and a shower of crystals is doubtless not unfamiliar to you. I once cured a renal colic by liberating a bunch of such crystals jammed in the ureter, through poking them with a ureteral catheter. One of my patients got into a much tighter place, as follows:

Case V. A pale, thin boy, seven years old, who had long been subject to renal attacks (not recognized as such) characterized by fever and vomiting. These attacks were usually relieved by calomel. On the morning of October 23, 1913, he passed some urine containing grit, and thereafter ceased urinating for four days, at which time he came into my hands with bilateral loin tenderness but no pain, considerable abdominal distension, a pulse of 100, blood pressure 140, temperature about 100°. I opened both of his kidney pelves, and decapsulated the kidneys in twenty-five minutes. The urine was under great tension, and was muddy with urate crystals, but no stone was found. The pelves were flushed out and left open. After two weeks of stormy convalescence his loins healed, though ten days later the left one reopened for three days. X-rays were negative after the operation.

Since that time his mother has been a little more prompt with her calomel. The urine remained purulent for two years; and he still has a faint trace of albumin, but no casts and no pus, seven years after his operation.

I have searched the records of some two hundred cases of renal colic in an effort to find how long it is possible for a stone to remain in the ureter and still pass without permanent damage to the kidney. Inasmuch as six months appears to be the accepted limit for awaiting the passage of stone after a renal colic, I have enumerated only those that went longer than this without gravely impairing renal function, as follows:

	Cases
9 to 12 months	5
12 to 18 months	3
18 to 26 months	6

These facts are recorded for your edification, not as a guide to practice. They illustrate the extremes, neither of which may be our guide.

Doubtless we may agree that operation for ureteral stone should be advised under three conditions; viz.,

1. Because of the alarming symptoms excited by the stone.
2. Because the stone does not progress and cannot be made to progress by manipulation, and
3. Because the stone is more than 0.5 cm. in diameter.

Or perhaps these three reasons might be summarized by the statement that the shape of a ureteral stone determines its fate.

The rounded stone, largely composed of urates or phosphates, produces relatively mild colics and its passage may be awaited with some complacency if it engages in the ureter before it reaches a diameter of 1 cm. But any of you who like myself have enjoyed the tempestuous passage down the ureter of a jagged flake of oxalate crystals so small as to be almost, if not quite invisible to the X-ray, will agree that words fail to do justice to the discrepancy between the size of the enemy and the distress it can cause. One can usually judge the shape of the stone with a certain degree of accuracy by the shadow it casts and the depth of the scratch it produces upon the wax bulb. Exceptionally, however, stones escape diagnosis not only by the X-ray, but by the wax bulb as well. I have three times failed to identify a small stone in the ureter by the wax bulb. One of the cases is so deplorable that it is worthy of contemplation.

Case VI. The patient came from out of town for a diagnosis. He had suffered from pain of moderate severity in the right side for three months. The pain suggested renal colic and was accompanied by the passage of blood, either microscopic in quantity or just sufficient to make the urine smoky. When he reached New York his pain had stopped and his urine showed nothing abnormal beyond a trace of albumin and a few leukocytes and red cells. Physical examination revealed nothing wrong. Ureter catheters obtained urine equal in quantity and quality from the two kidneys. Wax bulb showed no scratch although the catheter went readily to the kidney pelves. A pyelogram was negative. So I sent him home with the statement that

he had doubtless passed a small stone without noting its passage from the bladder (it is truly beyond belief how often this occurs). Within a week he was back with smoky urine and a little pain. Instead of reexamining him, as I should have done, I performed the operation that never succeeds in my hands—exploration of the kidney for a diagnosis. On finding the organ normal I even split it from end to end. Result: Zero. I passed a catheter down the ureter to the bladder. This revealed nothing. So I sewed up his kidney no wiser than I had been. He became infected and septic. Pneumonia followed, then empyema. Finally, as he was recovering he passed a wee ureteral stone—and I got the idea.

He has remained well for three years now and, I am proud to state, considers me a wonderful surgeon who saved his life.

In such a case as this nothing can save the diagnosis except an unfailing clinical conviction that in the face of symptoms suggestive of renal stone no negative evidence is worth consideration. I wonder how many of the cases of renal pain or bleeding that are relieved by a negative exploration of the loin are not actually cases of small ureteral stone undiagnosed.

But this difficulty of diagnosis applies only to the smallest stones. The others will show, will scratch, will give secondary changes such as dilatation discoverable by pyelography and ureterography, deficient renal function, infection. Indeed a proper diagnosis covers all of these points and ensures their correspondence. One cannot too often remind one's self that the complete clinical picture must include not only a set of statements from the patient all of which point to the same diagnosis, but a contributory set of data elicited by the more specialized methods of diagnosis. I know no case better calculated to offset the one last related, in which an unwarranted exploration of the kidney almost resulted in the patient's death, than the following in which the reluctance to exhaust every means of diagnosis, including a surgical exploration, combined with a lapse of clinical acumen to prevent a diagnosis that might have saved the patient's life.

Case VII. This patient had as his only symptom infrequent hematuria of such severity as to suggest neoplasm. The X-ray showed a

shadow suggestive of a large stone impacted in the ureter at the brim of the pelvis. This was before I was using the wax bulb, and cystoscopy and ureter catheterization revealed nothing abnormal. No renal deficiency; no pus or bacteria; no impediment to the passage of the ureter catheter. I should have known that he did not have a stone in his ureter, but I didn't. I operated and removed an enterolith from the much dilated vermiform appendix, which was sunk in an adherent coil of small intestine with which it communicated by many openings. I solaced myself with the possession of an interesting specimen and the fatuous theory that this stone might have caused the hematuria.

The patient disappeared for three years and then returned stating that his hemorrhages had recurred from time to time, latterly with such severity as to cause clotting in the bladder. He had suffered some discomfort in his right loin, but I could not palpate his kidney and ureter catheterization and X-ray were again negative, the right kidney showing plainly and being apparently normal in function, size and shape. As three years had elapsed since the beginning of his bleeding I relinquished the theory of neoplasm which was obviously suggested, and once again dismissed him undiagnosed.

This time he returned in a year, emaciated, his loin full of neoplasm inoperable to the extent that he died of my effort to remove the kidney which lay upon a bed of carcinomatous glands as big as itself.

It is to be remembered that a large ureter stone may neither appreciably impede the passage of a ureter catheter, nor scratch a wax bulb.

May the recital of these woes prove as profitable to you as I believe they have been to me.

BILATERAL STONE AND THE SINGLE KIDNEY.

The problem of stone in the kidney that is supporting the patient's life appears under various forms. We may enumerate the following:

Stone on one side, renal insufficiency on the other—
- due to stone (i.e., bilateral stone)
- due to other diseases of the kidney
- due to congenital deficiency
- due to urethral retention.

Stone in a single kidney—
atrophy of opposite kidney due to disease
after removal of opposite kidney
fused kidney
non-development of opposite kidney.

This great variety of conditions, from stone in both kidneys to stone in the one kidney the patient possesses, presents the common problem of the influence of disease or absence of the opposite kidney upon the treatment of renal and ureteral stone.

Bilateral stone.

This type condition of bilateral surgical renal disease, may exhibit various degrees of unilateral or bilateral renal deficiency, but its most interesting phase is that in which the patient complains of unilateral symptoms and examination reveals gravely deficient renal function due to large or multiple silent stone in the opposite kidney. Under such conditions the following rules for operation are doubtless generally acceptable:

1. The kidney showing the better function should be operated upon first.

2. The kidney showing acute symptoms is usually the sounder organ.

3. Impaction of stone in the ureter of the sounder kidney may temporarily reduce its function below that of its fellow. Under such conditions it is safer to operate first upon the side with ureteral stone.

4. Simultaneous bilateral operation may be attempted if the patient's condition is relatively good and the first operation not unduly long (thirty minutes).

5. In emergency, such as anuria, the sole object of operation should be to provide drainage to the kidney, usually by pyelotomy (which in case of anuria should always be bilateral). Such stones as cannot be rapidly reached and readily removed should be dealt with at subsequent operation.

6. Geraghty's formula, i.e., good concentration of urea and of phenolsulphonephthalein and small quantity of urine (with consequent low total 'phthalein) may be depended upon to indicate

an atropied or congenitally small kidney, inadequate to support life. I have twice correctly diagnosed unilateral renal deficiency of this nature by the Geraghty formula.

My impression has been that bilateral renal stone is very common. I have been surprised to find how few are identifiable among my cases.

I have classified as follows the cases in which the data were sufficient to permit of accurate classification:

Total cases	187
Bilateral	49
Total kidneys involved	236

The calculous crop from these kidneys was distributed as follows: (Estimates are per kidney, not per stone. Thus if a kidney gets rid of four stones and retains one, only the retention counts.)

Stone retained in kidney pelvis	95
Stone permanently arrested in ureter	60
Arrested in bladder	21
Arrested in urethra	3
Stone passed	68
	247

The duplications were as follows:

	Cases
Kidney pelvis and bladder	8
Kidney pelvis and ureter (same side)	3
	11

Many of these data run contrary to my preconceptions. Are not more than 25 per cent of stones bilateral? Are not more than 4 per cent of calculi arrested in both bladder and kidney pelvis? If 60 stones were arrested in the ureter, did not more than 68 kidneys succeed in passing all their stones? Is it true of stone-bearing kidneys that one-third of them retain at least one of their stones, that one-quarter more do not get all of their stones down the ureter, that from 10 per cent the stones are retained in bladder or urethra and that only a little over a quarter pass all the stones they make?

But one of the most interesting problems in prognosis these figures do not even hint at. We see most of these cases after they have had a renal colic. Our clinical resources permit us to say with a fair degree of accuracy that a patient who had had a renal colic is or is not free from stone. If he is, can we guarantee him against another renal colic? Obviously not. We can do nothing except to treat infection, if such exists. Well, then, if he may have other colics, are they going to threaten him more than the first one? My records only answer by failing to show a case where a kidney that passed its first stone successfully failed to pass the subsequent ones as well. Can this be the general rule? I hope so. At least I am encouraged to tell my patients—and myself—that a renal colic successfully weathered is the best possible insurance against retention of stone. It means that the kidney drains well, lets its stones escape early.

Silent stone

My list of silent renal stone cases is the following:

	Cases
Unilateral silent stone	9
Bilateral silent stone	2
Silent on one side, symptoms on the other	11
	22

The following cases illustrate extremes in the histories of silent stones:

Case VIII. An indolent, wealthy, heavy drinker. At fourteen years of age he passed a stone after a colic. At fifty he was found to have pyelitis. At fifty-five he began to suffer from neuralgia of the thighs, doubtless due to renal insufficiency. At fifty-eight he began to have mild attacks of hematuria. These continued until at the age of sixty-three he had a severe one, lasting several months. He lost 25 pounds in a year, and came to me for a diagnosis. The X-ray showed his kidneys to be widely distended with stones, and one small one stuck at the upper end of the right ureter. After five months of bleeding he passed this stone, regained most of his weight, and is now surprisingly fit at the age of sixty-seven.

Case IX. A Russian Hebrew. At eight years of age he had a hematuria. At fourteen passed stone. At nineteen litholapaxy (in Russia).

At twenty-four he entered Bellevue Hospital septic and with his first renal colic. He passed his stone and I removed large stones from both kidneys simultaneously. He was comparatively well, but with a mild infection of both kidneys, when I last saw him six months later.

Case X. Entered hospital with as alarming a renal colic as I have ever witnessed. The temperature on admission was 105°. The right loin was intensely sensitive and rigid. X-ray showed the left kidney full of stones, nothing on the right side. Within twenty-four hours the temperature fell to normal but the right kidney remained so large and tender that the initial diagnosis of perinephritis abscess was adhered to by certain members of the staff. Meanwhile he was cystoscoped, the left renal deficiency confirmed, and a small stone was seen in his bladder. This had evidently caused the right renal colic. He was kept in the ward two weeks while the congestion of the right kidney subsided, after which I successfully removed the left one, finding it completely destroyed by calculi. The stone seen at the first cystoscopy passed painlessly from the bladder and was lost.

Case XI. A sedentary business man; rather stout. At eight years of age he had a stone removed from the bladder. He recognized no further symptoms of urinary disease until at the age of forty-seven, while playing golf one day he did one of those things that to the non-golfer are mystery, and sprained his back so badly that he had to give up his game. By the time he got home his loin was both swollen and tender. A few days later a physician opened it, letting out a good deal of fluid blood. After this he was comfortable and able to resume his work, but the incision did not heal and after awhile it was discovered that the slight discharge from it contained urine. X-ray showed a kidney full of stones. He refused operation, and three years later he writes me that he still has his little fistula but is otherwise entirely well.

I shall not bore you with other histories. The symptoms of calculous anuria are familiar to you, as are those of rupture of the pelvis of the kidney. I have operated upon each four times. Two of the anuria cases died, the others recovered, as did all four rupture cases.

The common feature of silent stone cases is that their silence is an ominous one. Whether in kidney or bladder, the more prolonged the silence the more impairment of renal function has resulted and the greater the danger from any operation.

On the other hand the removal of small silent stones is indicated as a prophylaxis of the very renal impairment that results from their neglect. Such stones as may be removed without tearing of the renal substances should be operated upon after they have reached 2 cm. in diameter.

Stone in a single kidney

Let us extend the term "single kidney" to its widest physiological limit, and include not only those cases in which the opposite kidney is anatomically absent but also those in which it is merely physiologically incompetent to support life. May we not conclude that such a condition constitutes a surgical emergency? If the stone is impacted in the ureter of a single kidney it immediately and obviously threatens life; if silent the threat is less immediate, but none the less obvious. Stone in a single kidney not only may, but must be operated upon—unless there is some other contraindication to operation.

I have operated upon several such cases, the result of operation depending more than anything else on the degree of chronic renal deficiency due to prolonged suppuration. My most interesting and brilliant case was the following:

Case XII. An able-bodied Irish laborer, whose previous history contained nothing relating to his urinary organs, sat for two hours on a board covered with ice in February, 1915. Within a few hours he had quite a severe pain in his left loin, and the next day did not urinate. Alarmed at this he consulted a physician who passed a catheter but obtained no urine. Meanwhile the pain had disappeared and the patient felt perfectly well. So for six days he did nothing, though during that time he passed not a single drop of urine. He then entered St. Vincent's Hospital.

He said he felt well, but he was mentally a little stupid, his superficial capillaries were a little congested, his intestines distended, his blood pressure 170, his temperature normal, his left loin slightly tender, but owing to distention the kidney could not be felt.

The X-ray showed a large left kidney but no stone. The cystoscope showed a congestion of the bladder vessels corresponding to the skin congestion. There was not a drop of urine in the bladder. The

ureter catheter went 30 cm. up the left ureter, but drew no urine. A filliform ureteral bougie entered the right ureter for only 5 cm. and drew no urine.

I therefore immediately cut down upon the right loin, but found no kidney there. I turned him over and opened the left loin and found the left kidney very large, congested and tense. I incised the cortex and pushed a tube into the kidney pelvis, liberating an ounce or so of urine.

For two days he was semicomatose and then recovered and made a brilliant operative recovery. For three weeks he passed large amounts of urine daily from the loin tube, but none from the bladder. From the bladder washings streptococci were obtained. A second cystoscopy revealed nothing new. Then he began to urinate as much as 700 cc. in twelve hours. I therefore removed the tube and in a week the sinus closed, whereupon the temperature went to 105° and the loin reopened, so I replaced the tube and left it in.

In July, five months after the first operation he returned to the hospital, still passing all the urine through the left loin. I reopened the loin, found the kidney very adherent, the sinus entering the center of the cortex. I mobilized the lower pole subcapsularly, disclosed the adherent pelvis, and the ureter moderately dilated below a narrow tight stricture at the uretero-pelvic junction. I opened the ureter and found that I could not pass even a probe through the stricture. I hoped to do a plastic operation, but found that I could not mobilize the ureter or the kidney sufficiently to do so. I therefore made another incision an inch down the ureter and introduced a 20F. catheter through this up into the kidney pelvis, thus splitting the stricture wide open. This tube was left in for three days. Thereafter most of the urine came from the urethra, but four days later his temperature shot to 104 and remained thereabout for three days, when he passed a small phosphatic stone. His loin then promptly healed and his convalescence thereafter was uneventful.

Two years later, in July, 1917, after a week of pain and fever in the left loin he returned. I watched him for ten days, during which he had irregular fever, each relapse of temperature being accompanied by pain in the loin and definite anuria, the longest period of anuria being 24 hours. X-ray showed three shadows in the region of the left kidney, two of them regarded as stones. I opened the loin for the third time, found the kidney so bound down that I could hardly budge it, opened it through the old nephrotomy wound and found but one stone,

stuck in the orifice of the perfectly patent ureter. The convalescence was entirely uneventful except that I had to irrigate the kidney pelvis once through a ureter catheter to reestablish ureteral drainage.

In May, 1920, four years after his first operation he remained entirely well, at work and weighing 200 pounds, but I have had no opportunity to make any examination.

INFECTION AND STONE

One may well admit the many difficulties that surround the complete cure of the infection so often associated with renal and ureteral stone. A bacillus coli infection we look upon with a philosophic calm. It is at least not likely to occasion a relapse of the stone. But the cocci do occasion relapse even in kidneys that are seemingly draining well. Fortunately the cocci are particularly vulnerable to antisepsis by hexamethylenamin.

In this connection it may not be amiss to remind you that the frequent occurrence of epididymitis as a complication of renal stone with coccic infection is not without clinical significance. It means at least that the internal genitals are infected. You will of course find pus in the prostate and vesicles. I have taken this hint and in several cases succeeded in clearing up an otherwise intractable postoperative coccic infection by combining urinary antisepsis and massage of the internal genitals. Lavage of the renal pelvis on the other hand, has given me no better results than might be expected from the catheterization.

In short, the following routine may summarize my views on the treatment of renal infections associated with stone.

1. In operating maul and tear the kidney as little as possible.
2. Assure drainage by dilating ureter strictures widely, and if it seems wise, by fixing the kidney high in the loin.
3. Symptoms suggesting renal retention occurring while the loin is still open call for immediate irrigation of the kidney pelvis through the ureter catheter.
4. During convalescence, hexamethylenamin and bladder irrigation as a routine.
5. Remember that the source of infection may be in the tonsils, teeth, bowel, etc., and try to get rid of it.

6. Do not forget the prostate.

7. Use the wax bulb as a routine to detect the presence of stone or stricture of the ureter, even when you do not expect to encounter them.

OPERATIVE STATISTICS

I have performed 80 operations for stone in the kidney pelvis and ureter. They may be classified as follows:

Nephrotomy—24 cases (1 bilateral).

12 cures; of which 4 were known to remain well one to two years after operation.

10 incomplete or relapsed, of which 1 cured by second nephrectomy 6 years later.

2 cured by secondary nephrectomy.

1 died after secondary nephrectomy.

2 died; 1 by renal insufficiency 1 by sepsis.

Nephrectomy—33 cases.

22 recovered.

11 died, of which 2 from pulmonary tuberculosis, the kidney being tuberculous as well as calculous; 2 septic, the opposite kidney being apparently sound at the time of operation; one of these was a secondary nephrectomy. In both the patient was gravely septic at the time of operation.

1 post-operative ileus.

1 uremic, from chronic parenchymatous nephritis;

2 septic (bilateral stone).

3 of renal insufficiency (bilateral stone).

Pyelotomy—15 cases, (3 bilateral).

1 died.

3 remained severely infected.

1 stone relapsed.

10 cured, and in 8 cases the cures persisted for three years or more.

Ureterotomy—17 cases.

No deaths.

In 3 no stone was found. In two of these the stone was subsequently passed, one required subsequent nephrectomy for a cure.

2 relapsed.

Negative exploration of loin for stone—3 cases—All recovered.

The conclusions that may be drawn from this series of cases are the following:

Pyelotomy for the removal of small stones in the renal pelvis is an operation with singularly small mortality, and almost a certainty of cure.

Ureterotomy is equally benign. There is a small prospect of relapse, due to stricture of the ureter, which may be minimized by the routine dilatation of the stricture at the point of impaction. But small stones may elude the operator, and large ones call for nephrectomy, the kidney being destroyed.

Nephretomy is required for the removal of large or multiple stones in the kidney pelvis. Such cases are almost always infected and though the mortality is not high the trauma to the kidney parenchyma may excite acute focal suppuration requiring immediate nephrectomy, may leave the kidney fistulous or severely infected.

Nephrectomy for stone is always a grave operation. But if the opposite kidney is sound and the stones so large or so distributed that they cannot be removed by pyelotomy, nephrectomy is a safer operation than nephrotomy.

Stone or infection of the opposite kidney is thus no contraindication to ureterotomy or pyelotomy; indeed it is rather an indication for these operations. But it adds immeasurably to the probability of sepsis from nephrotomy, and gives a high mortality from sepsis and renal insufficiency following nephrectomy. Hence while we may well continue to operate upon such cases, forced to it by circumstances or moved by the proper surgical ambition to hope for better results by a fuller appreciation of the meaning of renal function tests and by improvement to operative technique, we may do so only under the most favorable circumstances and with a due appreciation that silent renal stone is often compatible with years of life in relative comfort.

DISCUSSION

President SQUIER: I am going to call on Mr. Henry Wade of the Royal Infirmary of Edinburgh to open the discussion on Dr. Keyes' paper.

Mr. WADE: First, I wish to thank the members of the Society for the great honor and privilege of being here and for the opportunity of taking part in your discussion.

I am sure the author of this paper (Dr. Keyes) has had a very interesting and wide experience with urinary calculi, and I will relate briefly the experience we have had in the East. During the greater part of the Egyptian campaign, while I was with the Expeditionary Forces there, urinary calculi were quite common, and I was in a very fortunate position where I could see them. In fact, I was the consulting surgeon to that force. With the troops in the field we were very careful to be on the outlook for the occurrence of hemorrhage from the urinary bladder on account of the widespread incidence of Bilharziasis in the native population. Ninety per cent of the rural native population of Egypt suffer from that disease. Fortunately few of the soldiers of the Expeditionary Forces contracted it, but when blood in the urine was detected in any of the soldiers in the field they were at once sent down for careful examination in a Base Hospital. They travelled down the long line of communication through the desert of Sinai for 180 miles. A journey that occupied usually two weeks. Their stay in the hospital for the investigation of their disease was frequently two weeks, and in those cases when they were found fit to return to their regiments a further three weeks usually elapsed before they rejoined their units in the field. To shorten this period during which so many soldiers were ineffective we established centers for urologic diagnosis close up to the firing line. To these centers all cases exhibiting, or having a history of, the occurrence of blood in the urine were sent.

The routine method of examination employed consisted of a chemical, cytologic, and bacteriologic examination of the urine conducted especially to detect the presence of oxalate of lime crystals, red blood cells, and the ova of Bilharzia. As the absence of the latter did not exclude the possible presence of the disease a further cystoscopic examination was carried out in all cases, and in certain cases the compliment fixation tests for Bilharziasis introduced by Major Fairlie of the Australian Medical Service employed. All cases were, thereafter, X-rayed and in many the cause of the bleeding was found to be due to tiny calculi impacted in the pelvic ureter. To exclude a possible fallacy due to the presence of a phlebolith being mistaken for a calculus, a graduated X-ray catheter was then passed and another photograph taken to localize the stone. In certain cases a pyelogram was taken.

From the material that was available I recently collected the records of fifty cases.

An interesting point was the fact that the people we were dealing with were not liable to anything like the same extent to this trouble at home. The explanation of this being the peculiar circumstances under which they were living. They spent their lives on the hot and sandy desert, the temperature ranging in summer from 110 to 115°F. The water supply was limited to half a gallon per day for each man for all purposes, drinking, cooking food, and washing. Further their diet was the customary army rations of bully beef, biscuit or bread, bacon and tea. Oxaluria was thus of common incidence, but I wish to confess the occurrence of this diminished as our diagnosis of calculi became more exact.

Of the 50 cases mentioned only 6 were operated on. Two were extracted by suprapubic transperitoneal operation. In 2 the stones had reached the bladder and become fixed there with the mucus membrane stretched over it like a calculus in the Ampulla of Vater in cases of gallstones. These were removed by suprapubic transvesical operation. The remaining two were extracted by transurethral operation.

I am speaking with due deference to our limited experience in comparison with that of Dr. Keyes, but it may serve to illustrate the great value of his contribution and explain how keenly I appreciate the opportunity of having been permitted to hear it.

Dr. BRANSFORD LEWIS, St. Louis, Mo.: One of the interesting phases of this discussion on Dr. Keyes' very interesting paper is that of diagnosis. I recall a presentation by myself before the Genito-Urinary Section of the American Medical Association in 1917 at the meeting in Chicago, in which I submitted what might be termed a new sign for differentiating between a phlebolith and ureteral stone in the lower part of the ureter. Of course, we all make use of the ureteral catheter to determine whether the shadow which has been obtained by the X-ray is in the line of the ureter. If we find the shadow separated from the catheter, it indicates at once that it is a phlebolith or calcareous deposit in a vein. But suppose the shadow lies against the catheter and is of such shape as possibly to be a stone or phlebolith; then the differentiation may not be made with the catheter. This happened in a case I was investigating, and one that gave marked symptoms of ureteral colic. But I was suspicious it was not a stone and put in a metallic ureteral forceps which, being more or less rigid, straightened out that ureter, and the X-ray picture then taken showed a separation between the forceps shaft and the shadow and distinctly made the diagnosis of phlebolith.

In the discussion that followed Dr. Kretschmer suggested that a stereoscopic view would make that same differentiation; by taking it at one angle and immediately taking it at another angle it would make the separation, provided it were a phlebolith and not a stone.

Recently I saw a very interesting case in which, at first, in taking a double picture there was a shadow apparently lying in contact with the ureteral catheter on that side (indicating) and one here. Then we made use of the stereoscopic view, and we found that there was in that stereoscopic view a separation on this side (indicating), but on the other side the same shadow was

present and apparently in line of the ureter and of the catheter, presenting with the stereoscopic effect pretty good evidence that there was a stone on that side, and the symptoms were on the same side. I was not convinced, and tried the introduction of the ureteral forceps, and then took an X-ray picture and found there was that definite separation of the forceps and the ureter from the shadow, and it was proved to be a phlebolith. The stereoscopic view had made the differentiation on one side but not on the other.

This is a useful procedure for making this differentiation, and it has stood me in good stead in two or three cases in which I could not make the differentiation without it.

Dr. H. L. KRETSCHMER, Chicago, Ill.: Dr. Keyes made the statement that two of his cases passed calculi without subsequent colic, illustrating that the patients had colic, the stone possibly being arrested and passed later without symptoms. I have seen this phenomenon in several instances. In one of his cases the patient recovered the stone; in the other instance the patient did not, and subsequent X-ray made over the site of the previous stone failed to show stone, so that we might assume the patient passed the stone. It seems to me that it is important to know whether "that" stone was passed or not, in order to exclude the possibility that the stone might have wandered back up the ureter and into the kidney pelvis.

In a recent paper I showed the possibility that a stone can wander back up the ureter, and in those instances in which patients have ceased to have colic, and a stone is not recovered in the urine, it would be a good plan to cover the entire urinary tract so as not to overlook the possibility of a retrograde movement of the stone.

In one of Dr. Keyes cases the patient had a blocking of the ureter by sand so that the ureter was blocked for two or three inches with fine sand and not a stone. During my service in U. S. Army Debarkation Hospital No. 5 we had an analogous case.

With reference to the remarks of Dr. Bransford Lewis, I would like to ask him a question, whether in the first X-ray he took which showed the catheter lying alongside of the stone in this way (indicating), he made a double exposure without getting anything?

Dr. LEWIS: I made two different exposures with two plates.

Dr. KRETSCHMER: The method we brought out sometime ago was to make a double exposure on one plate with a shift in the tube. For instance, given the presence of a shadow along the course of the ureter so that one is not sure of its being in the ureter after the shadowgraph catheters are passed and X-ray is taken. Then without changing either the patient or the plate a second picture is taken on the same plate, but this is preceeded by a shift in the tube, so that we have a double exposure on a single plate with a shift in the tube.

If the stone is in the ureter one sees two shadowgraph catheters and two stone shadows, both lying alongside the catheter. If on the other hand the shadow is of extra ureteral origin and happens to lie along side the shadowgraph catheter the second exposure projects the shadow away from the catheter. This point was well illustrated when this subject was reported in Surgery, Gynecology and Obstetrics in 1918.

So far we have had no regrets in using this procedure which is simply applying the principle of localizing foreign bodies—and which was used so extensively during the war.

Dr. FRANCIS R. HAGNER, Washington, D. C.: Dr. Keyes spoke of these silent stones and the relief of ureteral colic. There is nothing that will relieve colic like ureteral catheterization, and with a small olive catheter you can get by in dozens of cases and immediately sometimes the urine will be under such pressure behind the stone that it will squirt out of the catheter. It will squirt out of a no. 6 catheter that far [indicating]. One of my patients, a physician in Washington, while suffering from a very severe attack of renal colic, after considerable manipulation I

succeeded in passing the catheter by the stone, the urine squirted out of the catheter as if forced from a syringe, the patient experiencing immediate cessation of all pain. I firmly believe the pain in all these cases of ureteral calculus is caused by back pressure behind the stone, and that when they have no back pressure they have no pain. The pain is due to the back pressure behind the stone and to the distention of the kidney pelvis and ureter.

The fluoroscope is valuable in giving the location of the calculi with reference to the X-ray catheter and at times more accurate than the X-ray catheter alone. If you pass the catheter up to the stone and look at it through the fluoroscope and move the catheter, you will see whether the stone moves or not. We have seen the catheter against the stone, and as you passed on the catheter the stone moved a little.

Dr. KEYES (closing the discussion): In reference to renal colic, I quite agree with Dr. Hagner that if in passing the catheter you can succeed in relieving the pressure behind the stone, you can also relieve the patient of colic; but I feel that colic in that fever or anuria is far more unpleasant than destructive and prefer to relieve the spasm as much as possible while permitting the tension to continue, in the hope that this will push on the stone.

NEW GROWTHS DEVELOPING IN UNDESCENDED TESTICLES

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The idea that undescended testicles are prone to develop malignant tumors is old. The condition has recently been observed by the writer for the first time. On account of the rarity of this condition and the features of surgical judgment connected with it leads to the presentation of this matter for consideration and discussion.

The patient who brought this matter to the writer's attention is a man thirty years old who had no congenital defects other than bilateral undescended testes, and whose condition other than this defect was normal in every way. He was operated upon by Dr. Fred B. Lund at the Boston City Hospital on April 27, 1914, for this condition; at which time the right testicle was found to be in the right inguinal canal, associated with a congenital hernia. Nothing unusual was noted in regard to the condition of the testicle and it was placed in the scrotum and the hernia repaired after the method of Bassini. There existed a congenital hernia on the left side and the testicle, regarding which nothing unusual was observed, was found inside the internal abdominal ring. The testicle was placed in the scrotum and the hernia also repaired after the method of Bassini. The patient made an uneventful recovery and left the hospital in fourteen days. The patient remained well in every respect, except for a gonorrhoea in 1917, mild in character, without complications, and from which he recovered in a few weeks. About the middle of May 1919 (five years after the operation for undescended testicles) he noticed that the right testicle was slightly swollen and painful.

He consulted the writer on June 5, 1919 and stated that during the past two weeks that the right testicle had grown rapidly in size. Upon examination it was found that there was a solid tumor in the right scrotum the size of an orange, slightly irregular in contour, with the

suggestion of a small amount of fluid in the tunica vaginalis. The testicle on the left side was in normal position and was normal by palpation. Both hernia wounds were solid; there was no evidence of the extension of the growth above the scrotum; there were no inguinal nodes palpable, and the prostate and vesicles were normal by palpation and their secretion showed nothing of a pathological character. The patient's general condition was excellent.

Operation, June 7, 1919. The tumor mass was removed, from a scrotal incision which extended up the inguinal canal, without opening the tunica vaginalis. The cord was somewhat difficult to isolate from the scar tissue in the inguinal canal, but the cord was normal in character. The patient made an uneventful recovery following the operation and left the hospital in eight days. The pathological report is as follows:

"Specimen consists of testicle—laid open—occupied by a new growth forming a mass 7 by 4.5 by 4 cm.—Central portion of tumor is soft, rather papillary in character, 3 cm. in diameter, enclosed within a thin membrane. In peripheral portion tumor is lobulated, solid, with small cystic areas. Throughout the mass, especially in peripheral portion, occur spicules of bone.

"Microscopic examination shows a mixed tumor made up of connective tissue, supporting in places nests of atypical squamous epithelium, in places masses of atypical glands, elsewhere bits of cartilage, hairfollicles, and sebaceous glands. *Diagnosis:* Teratoma of Testicle."

The patient has been seen lately (eleven months following orchidectomy) is in excellent health, and nothing abnormal can be detected.

A perusal of the literature shows that new growths developing in undescended testicles is in reality of rare occurrence, usually occurs when the organ is retained within the inguinal canal or abdomen and the case here cited is the only one that can be found in which a tumor has developed in an undescended testicle, which has been replaced in the scrotum by operation. Buckley, in a most complete and excellent article upon this subject, records fifty-seven cases of new growth developing in undescended testicles collected from the literature up to 1913 and adds two which he had observed, making a series of 59 cases.

I have made a careful search of the literature since Buckley's publication in 1913, and have found one case recorded by Ochs-

ner, one by Butt, one by Grant, all of which were intra-abdominal tumors; and one inguinal tumor recorded by Lister and one instance of bilateral inguinal new growth recorded by Smith. My case, which is unique, had one undescended testicle in the right inguinal canal and the other in the abdomen; the testicle located in the inguinal canal being the one which developed the new growth five years after being placed in the scrotum by operation, while the one placed in the scrotum from the abdomen is apparently normal.

Bringing the reported cases to date we have 62 instances of intraabdominal tumors developing in undescended testicles and 3 of tumors developing in testicles retained in the inguinal canal, 1 case being unilateral, 1 bilateral, and 1 developing a new growth five years after an apparently normal testicle was replaced in the scrotum.

In this series of 65 instances of new growth developing in undescended testicles 43 were single and 22 double crypt-orchids. There are 34 instances of the growth developing on the right side, 25 on the left, and 3 bilateral. There are 3 instances in which the side affected is not noted.

Regarding the feature of *age* in connection with the subject it is found that tumors developing in undescended testicles is similar to tumors developing in normally placed organs; that is in adult life during the period of greatest sexual activity. The youngest patient in the series here recorded is seventeen years of age and the great majority are between the ages of twenty-five and forty so that there seems to be nothing in the condition of undescended testicle per se favoring an earlier development of new growth.

Of the *side involved* this point has been determined in 62 of the 65 patients. The right side in 34, the left side in 25, and bilateral in 3. In 4 of the series there were sexual characteristics that made the sex questionable, 2 being classed as males and 2 as females. (Male cases, Primrose, Marchand; female cases, Marion, Abel.)

The *Prognosis* as in all malignant testicular tumors is bad, and the *mortality* is high. The majority of the patients in this recorded series were dead within one year following operation and

Buckley states that only 3 of the 59 patients which he recorded were alive after two years.

Hinnman has pointed out that metastasis from a malignant tumor of the testicle may always be expected to take place in the lumbar lymph nodes, particularly in the nodes in the region of the renal pedicle when the tumor is on the right side and to the left of the aorta when the growth is located in the left testicle. Hinnman had advocated the removal of these nodes in connection with orchidectomy when these nodes are not clinically involved; basing this opinion upon the fact that but 15 to 20 per cent of patients with testicular new growth are cured by orchidectomy even before metastasis have taken place.

The classification of tumors of the testicle has not been uniform. In the series here presented the growths have been described as sarcoma of different varieties, carcinoma, cancer, epithelioma, rhabdomyoma and teratoma. Erving's classification, including all testicular new growths into one class of teratome or derivatives, is now generally accepted from the clinical viewpoint, and of two types, simple or complex teratoma or round-cell embryonic carcinoma. All testicular new growths may be considered malignant, and it is a well recognized fact, from the pathological viewpoint, that in the testicle more than any other organ it is possible to maintain a single embryonic origin of the great majority of tumors.

It is of interest to compare the relative frequency of new growth developing in the testicles normally placed, and those abnormally located. Eccles found in 38 cases of sarcoma of the testicles but 1 in an imperfectly descended organ. Howard, in 57 cases found 48 in testicles normally located and 9 in ectoptic testicles. Bulkley, in 11 testicular tumors records 9 as scrotal tumors and 2 as malignant abdominal tumors of testicular origin. Chevassu records a relative series of 113 scrotal testicular tumors to 5 abdominal testicular tumors. Odiorne and Simmons found 48 scrotal tumors to 4 abdominal tumors of testicular origin. Hinman, in a study of 32 patients found 7 to be in undescended testicles. Coley (discussion of paper by Grant) states that in 64 cases of new growth of the testicle 12 occurred in undescended testicles.

I have found 67 tumors of the testicle at the Boston City Hospital in which a histological diagnosis was made, all of which were testicular tumors originating in organs located in the scrotum and there were no tumors of testicles improperly descended. A *summary of these figures* shows that of 452 tumors of the testicle, 412 were developed in organs normally located and 40 in organs imperfect in their descent, which figures show that new growths occur 10.3 times more frequently in testicle normally descended than when imperfectly descended.

It is generally believed, upon what ground I am unable to ascertain, that undescended testicles lack the power of spermatogenosis and that transplantation into the scrotum does not change this feature. Eccles, however, asserts a contrary view. Whatever the truth of this matter may be the important point is whether or not transplantation has any influence upon potential malignancy. This is suggested by the fact that there has been but one patient observed who has developed malignancy in a retained organ transplanted into the scrotum and as we realize, the operation for undescended testicles is common. From the series of testicular new growth here recorded, and in the consideration of the whole subject of tumors of the testicle, it is noted that malignancy of the testicle does not manifest itself before the age of puberty, and it is an accepted fact that testicles imperfectly descended may make their way into the scrotum any time up to the age of puberty, which argues against operative interference before that time, unless an associated congenital hernia possesses features demanding it.

After the age of puberty a descent of retained testicles is not to be expected, and it has been shown that it is during the years of sexual activity that malignancy in the testicles manifests itself. For that reason it would seem good judgment to deal surgically with the abnormality of undescended testicles soon after the age of puberty; placing the imperfectly descended organ or organs into the scrotum when possible, and removing such organs when technical difficulties make this impossible. The rarity of new growth in testicles placed in the scrotum has been shown; the tendency to malignancy should be considered a constant factor in all tes-

ticles after the age of puberty, as noted by the relative frequency of such disease in normally descended organs; and, moreover, if new growth is going to develop in an imperfectly descended organ placed in the scrotum by operation the condition is more readily noted and can receive earlier treatment than if the testicular new growth develops in an organ retained in the inguinal canal or abdomen.

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DISCUSSION

Dr. E. L. KEYES, JR., New York, N Y.: I have had the good fortune to operate upon a good number of cryptorchids because men are sent from the fire and police departments to Bellevue Hospital for operation. I have done and have had done in my service operations on about 40 patients, and that means a much larger number of testicles. These were all in young adults, and we did not find evidence of teratoma in any of these cases.

During my practice I have seen three cases of malignant growth of abdominal testicles. One of them was reported in the literature as a sarcoma of the prostate, which was undoubtedly a teratoma of an indwelling testicle.

As to the point Dr. Cunningham brought up about not operating upon these cases until they reach maturity, so that any growth present may be found, I think delaying operation until maturity might impair the spermatogenetic function more than if the operation is done earlier. My own impression has always been to operate as soon as the patient is about eight years of age, and the structures are definite and large enough to encourage the prospect of being able to save the testicle.

Dr. CUNNINGHAM (closing the discussion): I have only a word to say in answer to Dr. Keyes. I think it is better, if possible, to delay operation in these cases until the age of puberty, hoping for a descent of the organ. I do not think operation at that time would impair the spermatogenetic function, and it seems safe, as regards the development of new growth, to wait until the age of puberty as new growths in retained organs have never been found before the testicle develops the function of spermotogenesis.

A SUGGESTION FOR THE POST OPERATIVE CARE OF VESICO-VAGINAL FISTULAE

A. L. CHUTE

For a considerable number of years I have rather enjoyed trying my hand in closing vesico-vaginal fistulae. I have had the feeling that I could close them in time but the very fact that I could not tell just when I should succeed, the gamble in the matter of time, has added a certain zest to the attempt. A little less than two years ago I tried a new procedure in the after-treatment of these cases which I believe is of considerable value, since with its use four consecutive cases have closed following a single operation, a thing I am sure I had never been able to accomplish previously.

The procedure, which is principally insisting that the patient lie on her face with a retention catheter following operation, is so simple that someone must have used and described it before, though in my rather superficial knowledge of the literature of vesico-vaginal fistula, I have no recollection of seeing it recommended. Whether or not this procedure has been described before, I believe its use for this purpose merits a much wider recognition than it has at present. I shall give short reports of four cases in which I have used this procedure.

The first patient was a woman of twenty who had her second confinement in June, 1917, and was first seen by me in October of that year. Following her confinement this patient had some rectal trouble for which she was sent into a hospital and etherized. During this examination it was found that she had some condition for which her surgeon recommended that vaginal hysterectomy be done at once. I assume that he suspected she had carcinoma of the cervix. At any rate hysterectomy was carried out immediately. Two or three days later urine began to leak from the vagina and had continued to do so up to the time that I saw her. In August or September, 1917, an

attempt to close the fistula was made by the operator who did the hysterectomy, but this was not successful. At the time I saw this patient she had a small fistula in the posterior part of the bladder in the median line. The latter part of October I made an attempt to close this opening, using the common procedure of refreshening the edges and putting in silver wire sutures. Four sutures were used. The patient had a retention catheter but in spite of this she showed after a few days a little leakage which continued regardless of the wearing of the catheter.

Late in November I repeated this operation and again failed to close the fistula. This patient, who was very neurotic, was getting into a bad condition mentally, so on January 22, 1918, I again closed the fistula in the same manner as before, using silver wire after carefully refreshening the edges. On this occasion I made a suprapubic incision and inserted a large suprapubic tube. I did this with the idea that it would increase the probability of my sutures holding. In spite of this the patient had a lot of bladder spasm and after a few days there was a little leakage through the fistula. Apparently this then ceased for a time but ten days after operation it was found that there was a very definite leakage present. The stitches were removed, a retention catheter was inserted, and the patient made to lie on her face. The catheter was left in place for about a week to ten days, and the position, on her face, insisted upon for the same time. There was no leakage from the very first and the fistula closed and has remained so.

In November, 1918, a woman of forty-seven was sent to me with the history that in August, 1918, her cervix had been amputated because of a scarred condition that it was feared was precancerous. There had been a leakage of urine by vagina since the operation. Examination showed that the opening in the bladder was at the back of the vagina and as large as an ordinary pencil. It was apparently bound to the uterus by scar tissue. There was a prolapse of bladder mucous membrane through the opening.

In November, 1918, the bladder was freed from the anterior surface of the uterus. Incidentally I opened the peritoneal cavity in this manoeuver. The edges of the fistula were thoroughly refreshed. The mucous membrane was closed with catgut sutures and the muscular tissue closed in a second layer with silver wire. A retention catheter was placed in the bladder and the patient made to lie on her face. There was no leakage at any time. The catheter was washed out carefully from time to time to prevent its clogging. It was removed

in about two weeks' time, the patient's fistula was solidly closed and has remained so.

Case 3 was a woman of about forty years of age seen in October, 1919. Her history was that two years before she had had a complete hysterectomy done for fibroids. Immediately following operation she had noticed a leakage of urine which had persisted; practically no urine was passed by urethra. The patient had been told that this leakage was due to the injury of a ureter.

Examination showed a small, round opening at the point where the roof of the vagina joined a rectocele that bulged in from behind. Cystoscopy showed the opening in the bladder to be anterior to a line connecting the two ureters and nearer to the right than the left. The bladder was separated from the rectum and the edges of the fistula refreshed. The mucous membrane was closed in one layer with catgut and the muscular tissue in another layer with silver wire. A retention catheter was put into the bladder and the patient made to lie on her face. On the sixth day after operation the catheter, which had been draining well, suddenly became plugged and when I saw her, a very short time afterwards, I found 8 ounces of urine in her bladder; there had been, however, no leakage through the line of suture. The catheter was changed and was worn for about 6 days more; there was no leakage at any time. On the sixteenth day the silver stitches were taken out and the patient went home on the twentieth day. She reported not long ago that she remained well.

The last patient of this series was a woman of fifty, also seen in October, 1919. She had been operated upon one and one-half years before for uterine fibroids and a complete hysterectomy done. She had had leakage of urine since that time. One attempt to close the fistula had been made some time before. I was told that this attempt had been made under local anaesthesia and had not been successful. The fistula, which was a small one, was anterior to the opening of the right ureter. It was dissected free; its edges refreshed; the mucous membrane closed in one layer with catgut and the muscular tissue in a second layer with three silver wire sutures. A retention catheter was placed in this patient's bladder and she was made to lie on her face. This patient was often bewildered at night and pulled out her catheter on several occasions but it was promptly replaced and its removal apparently did no harm. The catheter was worn for two weeks; during the latter part of this time the patient was allowed to be on her side a little, and occasionally even to turn on her back for

a short time; however, most of the time she was required to lie on her face. The stitches were taken out four days after the catheter was removed; there was no leakage at any time following operation.

In these cases I believe the position employed, that of having the patient lie on her face, was the important element in bringing about the successful outcome. This position prevents any weight of urine or of intestine from exerting pressure on the line of suture. This weight, I believe, tends to pull the edges of the incision apart. When the edges of the bladder incision are kept at rest in accurate apposition as is the case when this position and the retention catheter are employed, the edges of the incision very soon adhere fairly firmly, as was seen in case 3, in whom six days after operation the catheter became plugged and the bladder was found to be holding 8 oz. of urine without any leakage through the line of suture. This plugging of the catheter emphasizes the importance of making sure that the retention catheter is kept clear by syringing occasionally a little fluid through it, and it is also a wise precaution, four to six days after operation, to carefully remove the catheter and cleanse it of any accumulation of phosphates that may have taken place. The importance of this last depends somewhat on the clearness of the urine and the tendency to precipitation of phosphates that is present in the individual case.

As regards the type of operation one should employ in these cases I believe that it is perhaps better, when one can, to unite the mucous membrane in one layer and the muscular layer in another, however, bringing the tissues together in one layer is a very satisfactory method. When all the tissues are united in one layer, one should be careful to insert his sutures in such a way that they do not penetrate the bladder cavity, though even if this is done there will be less chance of leakage along the sutures when the patient is left on her face, as I have suggested, than if the patient were in the dorsal position during her convalescence.

The position that I employ, with the patient lying pretty nearly flat on her stomach, is very irksome, and for the most part she complains of it more or less bitterly, but this seems of minor im-

portance if by this means we can materially increase the probability of a successful operative result in these cases, which so often require repeated operations before the fistula is closed.

It seems more than likely from the course that I employed with my last patient that one can probably be a little more lenient as regards the position than I was inclined to be at first and that one can with reasonable safety allow the patient after a few days to lie on her side a certain portion of the day and perhaps toward the latter part of her convalescense allow her even to lie on her back for a little of the time. I believe that the use of this very simple manoeuvre will greatly increase the proportion of vesico-vaginal fistulae that close following a single operation.

DISCUSSION

Dr. J. Bentley Squier, New York, N. Y.: I would like to say a word in the discussion of Dr. Chute's paper on a surgical detail which I have used for the last year and have been able to close five cases of urethro-rectal fistulae. I do not claim this as original at all, but the point is that in these patients the fistula have all healed up.

The patient, we will say, is in the lithotomy position, and he has an opening between the urethra and rectum. The first step of course is to make a dissection of the perineum, find the bulb here (indicating on blackboard) and the rectum down here. Let us say the opening in the rectum is there (indicating) and the opening in the urethra here (indicating), and you have separated well up to the apex of the prostate; you have separated the rectum away from the urethra; that you have made a pursestring or Lembert suture, or whatever you use, to close the rectal opening. Put in an indwelling catheter in the penis, freshen up the edges and suture here. After you have repaired the rectum from the ischio-rectal fossa, cut a piece of fat; sew the fat over the rectal suture line and close the wound any way you like. In five cases the fistulae have healed up without trouble. One was a case that had a prostatectomy done in an innocuous way in which Dr. Keyes said there was no danger of rectal puncture. Subsequently a recto-urethral fistula developed. Two of them were traumatic cases, one in a young man who had gone twenty years with a perineal sinus and a rectal urethral sinus. He passed all his water sitting down since he was nine years of age.

The idea of using fat is not new. In a thin patient it is necessary to get fat from the iscio-rectal region, but I think you can get fat almost anywhere. It is always hard to get in thin patients from the ischio-rectal fossa.

Dr. JOHN R. CAULK, St. Louis, Mo.: I am very happy to see that Dr. Chute puts us on the map in the closure of vesico-vaginal fistulae. I have seen quite a number of vesico-vaginal fistulae and the postoperative care depends upon the type of operation done. I have had two delightful results in small fistulae with high frequency burning. I had one woman a year ago who had a fistula for three months, every drop of urine coming through it. It was back of the trigone internal to the left ureteral orifice. The fistula was the size of the head of a large match. I put in the high frequency electrode and burned it from the vesical side out and catheterized the ureters. The left ureter was implicated on the corresponding side of the fistula as the ureter was ligated; we introduced a catheter on the right side, and after one burning cured the fistula. She has not had leakage of a drop of urine from that day to this.

I had another case in which the fistula was on the posterior vesical wall. Two or three burnings burnt away the scar. The fistula healed, although she had a good sized hole. I made a report of these cases at the Southern Medical Association. Dr. Barringer has had delighful results with high frequency in these cases.

For larger fistulae, I have been under the impression for a long time that suprapubic drainage for relief of tension was the thing to do, and I suggested to our gynecologists to carry this out in conjunction with the vaginal plastic. This first case in which suprapubic drainage was used had no ultimate leakage.

Dr. W. W. TOWNSEND, Burlington, Vermont: I would like to ask Dr. Caulk if any of the cases he cited were treated with the ureteral catheter left in and without the high frequency current. In 1915 I reported to this association two cases in which I succeeded in closing the fistulae by using indwelling catheters.

Dr. JOHN R. CAULK, St. Louis, Mo.: I did not feel that ureteral catheter drainage would suffice to cure these vesico-vaginal fistulae which are encircled with such dense sclerotic borders, which need to be freshened and stimulated. As a matter of fact,

my last case was not drained effectively with the catheter, and healed without catheter drainage.

I have understood that Dr. Townsend's cases were uretero-vaginal fistulae, and the healing was evidently due to the fact that he had dilated the stricture below the point of obstruction.

This has nothing in common with vesico-vaginal ones.

FLUOROSCOPIC EXAMINATION OF THE INJECTED KIDNEYS, AND REPORT OF A CASE

F. R. HAGNER

Fluoroscopic examination of the kidneys, both with and without injection of the pelvis of the kidneys, is, I believe, a valuable adjunct to the accurate diagnosis of certain kidney conditions. It can often be definitely settled whether a shadow in the kidney region is caused by a calculus in the kidney or is due to some calcareous deposit in the gland or some other organ. The X-ray catheter or injection of the pelvis may be necessary to make an accurate diagnosis, the fact of being able to see the catheter in place and observing the simultaneous movement of the catheter and the shadow of the calculus caused by the respiration will often help materially in clearing up the diagnosis. Our ability to see the kidney injected and to watch the fluid escaping into the pelvis often gives us information more valuable than roentgenography.

I will quote Dr. Merritt, the roentgenologist of Garfield Hospital, who summarizes his views and gives his technique as follows: The method assists materially in locating the kidney and estimating its size. Stereoscopic plates are always made afterwards as a matter of record but they seldom if ever give additional information and many times the lesions show more plainly in the fluoroscopic than in the X-ray plates.

The essential points are as follows:

1. A low gap, not more than four inches and as low as two.
2. Five milliamperes of current.
3. Absolutely darkened room, with operator protected from daylight at least twenty-five minutes prior to the examination.
4. The patient having been previously catheterized, is brought in on an ordinary hospital cart and transferred to the X-ray table when the injection of the ureters may be performed at the pleasure of the urologist.

I have an interesting observation to report but will not go into the history of the case except briefly. This was a case of pyelitis in which we made a diagnosis of a suppurative perinephritis.

Both Dr. Fuller and I thought there was possibly some connection between the pelvis of the kidney and the suppurative process outside the kidney. Patient's kidney was injected and fluoroscopic examination was made during injection of the kidney. As soon as 10 cc. of thorium was injected into the pelvis, the injected fluid began to escape into a cavity outside of the nephritic tissue. Another 10 cc. was injected and the fluid could be seen escaping out into this cavity in a stream—no force being used—patient complaining of no pain. This showed much more distinctly while watching it than it does in the plate I have here.

At operation the next day, when the kidney was exposed and the abscess cavity explored it was found to connect with the kidney pelvis. The kidney was drained as was the suppurative area around it. The convalescence of this patient was very interesting but that is another story. He is now well, having clear normal urine from both ureters.

SECOND DAY, JUNE 1, 1920

PRIMARY CARCINOMA OF THE KIDNEY WITH IMPACTED URETERAL CALCULUS

H. G. BUGBEE

New York

CONFUSION IN DIAGNOSIS

In view of the confusion which has so long existed with regard to the differential diagnosis of tumors of the kidney, particularly true malignant disease and hypernephroma, and because of the fact that the question of the origin of these neoplasms is still under dispute, it would seem important that additional cases be reported in an effort to clarify the problem.

Hypernephroma, generally conceded to be the most common renal tumor occurring in the adult, "that tumor whose place is still so indefinite in pathology," is undoubtedly, according to Eisenstadt (1), the most frequent lesion which has been incorrectly classed as carcinoma. From a study of the literature of primary cancer of the kidney, which he found to be replete with reports both of clinical nature and of histologic research, Eisenstadt found from the earliest record at his disposal (the inaugural dissertation of Hullman at Halle, published in 1849) to the time of his own report (1916) a seeming confusion in the histopathologic reports made.

Dunn (2), in an effort to elucidate the origin of hypernephroma, the so-called "Grawitz tumor" of the kidney, reviewed briefly the theories of its origin. Grawitz (3) in 1883, advanced the view that these renal tumors were of suprarenal origin, arising in aberrant "rests" of suprarenal tissue, a theory that was gener-

ally accepted for twenty-five years, or until Stoerk (4), from an examination of a large number of kidneys and suprarenals, and of tumors affecting these organs, concluded that hypernephroma was derived from renal tissue itself, most probably arising from the altered renal epithelium lining papilliferous cysts in the cortex of granular kidneys. Zebe (5) shared Stoerk's conception of the origin of these tumors. Sissons (6), on the other hand, was inclined to accept the view that these renal growths are derived from suprarenal tissue. He pointed out the difference in the distribution of fat in the Grawitz tumor cells on the one hand, and in adenoma of the suprarenal cortex, on the other. Wilson and Willys (7), from embryological studies, considered it unlikely that these tumors were derived from adrenal "rests" in the kidney, since from evidence of development the inclusions of suprarenal tissue under the renal capsule must be rare. These two observers regarded hypernephroma as of renal origin, but derived from rests of nephrogenic tissue, and not from mature renal cells which have undergone metaplasia, as held by Stoerk. Glynn (8) pointed out

> that in the comparatively few cases of tumors of the suprarenal cortex which are reported in the literature, the association with abnormality in sexual development is a frequent feature. On the other hand, in cases of Grawitz tumor, which are not very uncommon, such sexual changes are never noted.

From his review of the theories concerning the origin of hypernephroma Dunn concludes that (1) Epithelial abnormalities of the three types described, namely, suprarenal rests, adenopapillary tissue, and papilliferous cysts, have been found fairly frequently in the kidneys of a series of eighty consecutive cases. The amount of material examined, though insufficient to afford definite statistics, is sufficient to prove that their occurrence is by no means rare. (2) Any of these aberrant epithelial structures might conceivably give rise to malignant tumor formation, but of the three the papilliferous cysts, from their peculiar histological features, suggest themselves as the most probable origin of tumors of the Grawitz type.

Kretschmer and Moody (9) have called attention to the multiplicity of terms used in the diagnosis of tumors of the kidney, especially tumors of the renal pelvis.

RELATIVE FREQUENCY

While hepernephroma, as stated, may be regarded as of frequent occurrence, true malignant neoplasms of the kidney are generally conceded to be relatively rare. Albarran and Imbert (10), for example, in 1903, found only 13 cases of malignant adenoma out of 529 cases of renal tumor. Garceau (11) compiled, from autopsy and operating rooms, a table comprising all tumors affecting the urinary tract at the Massachusetts General Hospital during a period of ten years. Among these he found the following malignant tumors: hypernephromata of large size and of distinctly malignant type, 33; carcinomata, 3; sarcomata, 2; malignant papillary adenomata, 4. He holds that carcinoma of the pure type is a tumor of extreme rarity in the kidney, and he insists, from his personal investigations, that the tumor most commonly found in the kidney is that derived from adrenal "rests," namely, hypernephroma. Eisenstadt refers to one case found by Young from the files of Johns Hopkins Hospital, and three cases found in the ten and a half years preceding 1916 at the Mayo Clinic. Kretschmer and Moody (9), in 1914, found reported only ten cases which resembled the main characteristics of the malignant papillary cystadenoma which they reported, bringing the number up to eleven. Wohl (12), in 1917, added one case, making twelve cases of true malignant disease of the kidney. Kraft (13) reported an unusual case of hydronephroma resulting in medullary carcinoma, with a history of injury and the passage, thirty-seven years before, of nineteen stones, and with malignant degeneration of the hydronephrotic kidney. de Berbe-Lagarde (14) reported a similar case. Hirsch (15) recorded a case of papillary carcinoma of the kidney with metastasis in the brain, which he considered primary. Primrose (16) described a case of squamous-cell carcinoma of the kidney in a horse-shoe kidney with calculous pyonephrosis.

CLINICAL DIAGNOSIS

Braasch (17), studying the clinical records of 83 malignant tumors of the kidney operated on at the Mayo Clinic up to July 1, 1912, classified these tumors according to their histologic structures as hypernephroma (mesothelioma), sarcoma, carcinoma, and embryoma, but pointed out that clinical differentiation, according to this histologic classification, could not be made, as a rule, prior to exploration. From a clinical point of view, therefore, he considered the various forms of tumor together. Complete data of malignant renal tumor (palpable tumor in the region of the kidney, hemorrhagic urine, persistent pain referred to the region of the tumor, and the general symptoms of malignancy) were found in but 32 of the 83 cases studied. Two of the three symptoms were present in 37 cases, and but one in 14 cases. He considers it evident, therefore, that the clinical diagnosis must more often be made with but one or two cardinal symptoms.

The principal problems in differential diagnosis, according to Braasch, are identification of hematuria and upper abdominal tumor. The conditions which most easily may be confused with renal tumor are (1) "essential" and nephritic hematuria, (2) retroperitoneal tumor, (3) bilateral cystic kidney, and (4) closed pyonephrosis. He holds that hematuria, prolonged over a period of several weeks or months, and occurring at long intervals, is suggestive of "essential" or nephritic hematuria, while that which continues but a day or two and reappears at short, irregular intervals, suggests renal tumor. These statements were made before pyelography became a common practice in the differentiation of renal pathology. While a combination of kidney lesion may be present, masking the picture, still a pyelogram renders a diagnosis of renal tumor possible in the vast majority of cases.

Hirsch (15), reporting a case of papillary carcinoma of the kidney, with metastases in the brain, considers that the absence of positive urinary findings need not be taken seriously. In Eisenstadt's case (1) hematuria was present, at intervals, for years previous to operation, not accompanied by pain or other

general symptoms. Two years before operation a severe attack of hematuria occurred, accompanied by burning pain in the penis during urination, and dull pain in the right lumbar region, gradually growing worse until operation.

HISTOPATHOLOGIC DIAGNOSIS

The tumor reported by Eisenstadt is considered an atypical proliferation of the secreting cells of the kidney, in many places showing exquisite papillary structure, and as such, in his opinion, could be considered as a carcinoma of the adenomatous type. Papilloma, he holds, as well as the embryonic mixed tumor, or kidney blastoma, otherwise known as adenosarcoma, have repeatedly been described under cancer, adenosarcoma usually as carcinoma of the kidney in childhood. In the case which he reported the minute pathology showed adenomatous or papillary structure, striking in some areas, while in others the cells were arranged in massive compact aggregations. Some of the glomeruli were but slightly changed, some showed changes of hyperplastic character and still others chronic fibrous retrograde changes. The histopathology of this case suggested that these tumors may arise from the glomeruli, instead of from the uriniferous tubules, as some hold.

In Wohl's case of adenocarcinoma (12) he could trace the transition from renal parenchyma into tumor formation. The tissue from the middle third of the tumor showed a great tendency to mimic the tubular structure of the kidney. Wohl believes the contention that primary carcinoma of the kidney does not exist, the argument of those so-believing being based upon the mesodermic origin of the kidney, is untenable, since the renal tubules are lined by epithelium of whatever layer of the blastoderm it comes from, and therefore any tumor arising from it can justly be called adenoma, carcinoma, or adenocarcinoma.

Case report. The case which I wish to report is that of a man, forty-four years of age, married, father of three children, with negative family history. At the age of five he was confined to bed two months with "inflammation of the bowels" (probably appendix). In 1892 he

had a sharp attack of left renal colic, but did not pass a calculus. About fifteen years ago he had another attack, following which he noticed that after riding horseback his urine was sometimes claret-colored, but he had no colic or other urinary disturbance. He had no serious illness or urinary symptoms until October, 1918, when he had a severe attack of influenza. Two weeks after the onset of the influenza he developed profuse hematuria, pain and tenderness in the left upper quadrant and left lumbar region. Later moderate frequency and urgency of urination were noted, and a mass was palpable in the left upper abdomen. He rapidly lost flesh and strength, becamed decidedly anemic, and when I first saw him, two months after the onset of the symptoms, his condition was as follows: There was profound anemia, the hemoglobin being 33 per cent; the pulse was rapid and of poor force; the temperature varied from subnormal to 102°; tongue coated; appetite poor; emaciation and prostration marked. There was an indefinite mass in the left upper quadrant and lumbar region, which was not hard, was slightly tender and movable. The right kidney could not be felt. The external genitals, prostate and vesicles were negative. The urine was thick with blood and pus. Cystoscopic examination showed a moderately congested bladder, especially the trigone and area about the left ureter, but otherwise negative. Ureteral catheterization showed clear urine, with a moderate nephritis of the right kidney, an obstruction of the left ureter at 25 cm. from the bladder, but a fairly free flow of urine on this side, which showed a large quantity of blood and pus, with poor function (one-fifth that of the right). A roentgenogram revealed a large oval calculus in the left ureter at the point of obstruction to the catheter, 25 cm. from the bladder. Pyelogram showed the renal pelvic outline destroyed.

Cultures showed right urine negative, left, staphylococcus and short bacillus like influenza.

The patient's condition was such that operation was thought inadvisable, and he was placed under close observation. At the end of a week, the hematuria and temperature persisting, loss of strength and enemia progressing, operation was decided upon as a necessity, with the possibility that he would not survive the anesthetic. The hemoglobin was now under 30 per cent, pulse 130, and of poor force.

The preoperative diagnosis was impacted ureteral calculus and pyonephrosis.

Operation, December 21, 1919, under nitrous oxide anesthesia. An oblique lumbar incision exposed a mass of blood clot and pus surround-

ing the kidney, which had the appearance of being gangrenous. The kidney and clots were lifted out, leaving the kidney capsule. The blood vessels at the hilum were secured with two mattress sutures, the wound was packed with gauze and partially closed with through-and-

FIG. 1. IMPACTED URETERAL CALCULUS. KIDNEY TUMOR

through sutures. The operation required but a few minutes, but the patient's condition did not warrant further exploration. The patient rallied from the operation, he improved rather rapidly in his general well-being, the hemoglobin rose to 45 per cent, red blood cells 2,623,000 from 2,212,000, and the right kidney functionated satisfactorily.

This condition continued for two months, when an induration appeared beneath the surface of the wound, there was a foul discharge from the sinus, and a growth rapidly developed in the flank, which increased in size until, at the time of his death five months later, it extended below the ilium and filled the lumbar region. The appearance on the surface was typically that of carcinoma.

The left kidney, on removal, was of a purplish color, 10 by 6 by 4 cm., flat, smooth on one side, rather ragged on the other; there were no kidney markings and the appearance was that of a softened tumor mass. The surface presented a mottled appearance, as in the photograph. Sections were submitted after operation to Dr. Burton T. Simpson of the New York State Institute for the Study of Malignant Disease, who made the diagnosis of primary carcinoma of the kidney.

I am indebted to Dr. Lawrence W. Strong, head of the pathological department of the Woman's Hospital, for the following careful microscopical study of this specimen, and for the accompanying microphotographs made by him:

The section received shows for the largest part a hemorrhagic and necrotic connective tissue in which the remains of dilated blood vessels were seen. Around and in the neighborhood of some of these vessels are solid alveoli of large epithelial cells with vesicular nuclei which nearly fill the cell bodies. In places the epithelial cells are polyhedral but where the cells are looser they are oval. Many nuclei are gigantic and mitotic. No arrangement in columns is visible save where the cells penetrate a lymph space or spaces in the connective tissue stroma. No stroma can be seen between the cells in the alveoli. The photos and lantern slides we made illustrate the persistence of well nourished carcinoma cells around a large blood vessel. The tissue in the periphery was entirely necrotic.

The second picture shows the variability in size of the cells, the presence of giant cells, the lack of any sign of columnar arrangement or of papillary forms, also hyperchromatosis of the nuclei and irregular mitoses are seen. From the slides submitted one is only able to say

that this is consistent with the picture of a medullary carcinoma. Whether it was primarily a medullary carcinoma or not is a matter of

FIG. 2. PRIMARY CARCINOMA OF KIDNEY. GROSS SPECIMEN

conjecture. There is nothing in the sections which suggests a hypernephroma of which the determining characteristics are an arrangement of the cells in columns. The cells of a hypernephroma are character-

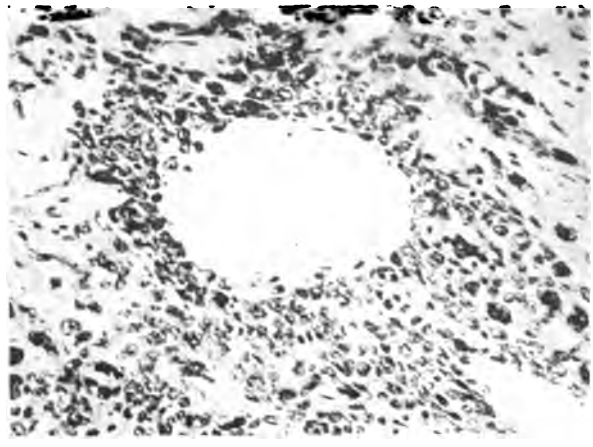

FIG. 3. MICROSCOPIC SECTION OF KIDNEY. BLOOD VESSEL SURROUNDED BY CARCINOMA WITH NECROTIC PERIPHERY

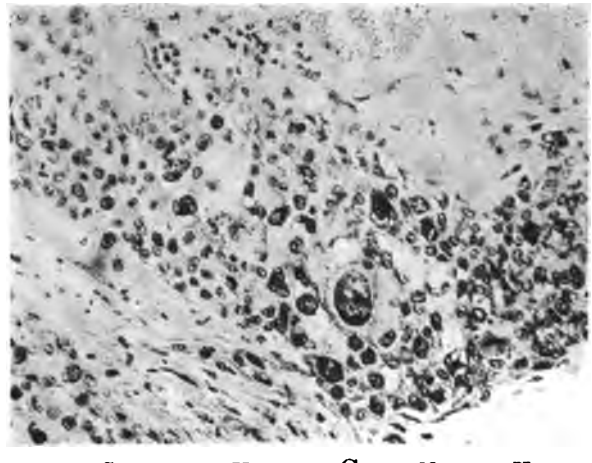

FIG. 4. MICROSCOPIC SECTION OF KIDNEY. GIANT NUCLEI, HYPERCHROMATOSIS AND IRREGULAR MITOSES

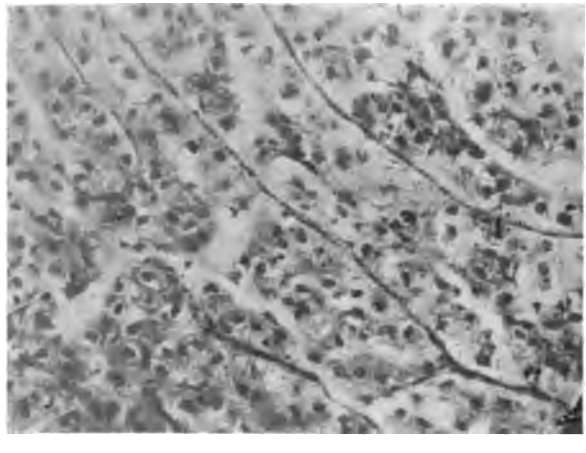

FIG. 5. MICROSCOPIC SECTION OF HYPERNEPHROMA, SHOWING THE CELLS IN COLUMNS. (INSERTED FOR COMPARISON WITH FIGS. 3 AND 4)

istically large, pale, fat—containing cuboidal cells. There may be a papillary or adenomatoid arrangement and the stroma may present appearances suggestive of a spindle-cell sarcoma. A tumor of this sort may also show cells which are distinctly carcinomatous, of very variable size and appearance and with multinucleated giant cells.

Fraser (18) reports a case showing both carcinoma and hypernephroma and it is conceivable that Dr. Bugbee's case is a completely anaplastic hypernephroma, that is that all traces of its original form have been lost by anaplasia. However, there is nothing to justify this assumption; all that the sections present is a diagnosis of medullary carcinoma.

I wish to emphasize the following points in connection with this case:

1. Carcinoma of the kidney is rare, but does occur as a pathological entity, to be differentiated from hypernephroma.
2. The diagnosis cannot be made before operation.
3. The rôle of infection and nephrolithiasis in its etiology is suggestive.

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TUBERCULOSIS OF THE KIDNEY COMPLICATED BY IMPACTED PELVIC CALCULUS

H. A. FOWLER

Fortunately the occurrence of true stone and tuberculosis in the same kidney is rare. The differential diagnosis between renal lithiasis and renal tuberculosis, while relatively simple in many cases, may be extremely difficult or impossible without exploratory operation.

Among the methods employed in modern urologic diagnosis, roentgenographic examination is undoubtedly the most valuable in differentiating between the two conditions. The shadows which are seen not infrequently in tuberculous kidneys, due to the deposit of lime salts in the caseous areas, are confusing, and may be easily mistaken for those of true stone and lead to an error in diagnosis. However, the occurrence of multiple shadows, widely scattered within the kidney area, the absence of uniform density, and their irregular contour, will usually lead to a correct interpretation.

That true stone and tuberculosis does at times occur in the same kidney is shown by a recent observation in which the stone was impacted in the pelvic ureter, causing complete obstruction. The case history is briefly as follows:

On February 24, 1920, I saw in consultation with Dr. Ruffin, Mrs. L. W., aged, thirty-seven years, who entered the George Washington Hospital on February 18, complaining of pain in the right kidney region and right iliac fossa. The following history had been obtained: Father died at fifty-two years of Bright's disease. Mother died at thirty-seven years of typhoid fever. Two brothers, aged twenty-seven and thirty-three years, are in good health. One sister is well except for a persistent headache for the past two years. There is no history of tuberculosis, cancer, syphilis, gout, rheumatism, or other hereditary disease.

FIG. 1. SMALL STONE IN LEFT KIDNEY (SECOND RECURRENCE). LARGER STONE IMPACTED IN RIGHT PELVIS PRODUCING COMPLETE OBSTRUCTION

Past history. The patient was a delicate child. She had diphtheria at two and again at seven years of age. There were no complications or sequellae. The period of adolescence was notably one of health. At the age of twenty years she began to suffer with pain in the left kidney region. The diagnosis of renal colic was made at that time. These attacks recurred at intervals of three to five months. At the age of twenty-one years an X-ray examination showed a stone in the left kidney. In February of the following year, 1905, a stone was removed from the left kidney by Dr. Geo. Ben Johnson, of Richmond.

She was married in 1907, at the age of twenty-four years.

Ten years after the first operation, May, 1915, she was operated upon by Dr. Moore, of Alexandria, and a stone the size of a bean was removed from the same (left) kidney. Two years later, March, 1917, she was examined by Dr. Hagner at the Garfield hospital, Washington. Both ureters were catheterized, and an X-ray examination was made of the kidneys. A stone was found in each kidney, the larger one being on the right side. Three months later, while in Richmond, she was seized with a severe attack of pain in the right side which was diagnosed renal colic. Returning to Alexandria she was operated upon for appendicitis and a healthy appendix removed.

In October, 1918, she had influenza, during the epidemic of that year. Following her recovery from this, she had repeated attacks of colic requiring morphia to control. She was treated by a chiropractor, who gave spinal massage. At this time she began to lose weight. During the next six months she lost 25 pounds.

In July, 1919, while at the sea-shore, she was suddenly seized with a sharp pain in the right kidney. Thereafter she was unable to lie prone on account of pain which was relieved only by being propped up with pillows. She returned to Alexandria the following September, suffering with severe pain in the right hypochondriac region. An X-ray examination at this time showed a stone in the right kidney. In November she had a severe attack of colic, localized in the right kidney. She was treated by a homeopathic physician for a time, and finally consulted Dr. Ruffin.

Habits. No irregularities or excesses in mode of living. She has never been pregnant. Her usual weight is 150 pounds. She now weighs 126 pounds. Her present illness is a continuation of her previous illness. During the past three months she has been suffering with a dull pain in the right kidney and the right iliac fossa.

During the first period of twelve days that she remained in the hospital, the temperature ranged between 97° and 99.8° running a mildly septic course. Examination of the blood gave a red cell count of 4,200,000, leucocytes 15,000, haemoglobin, 60 per cent. The urine

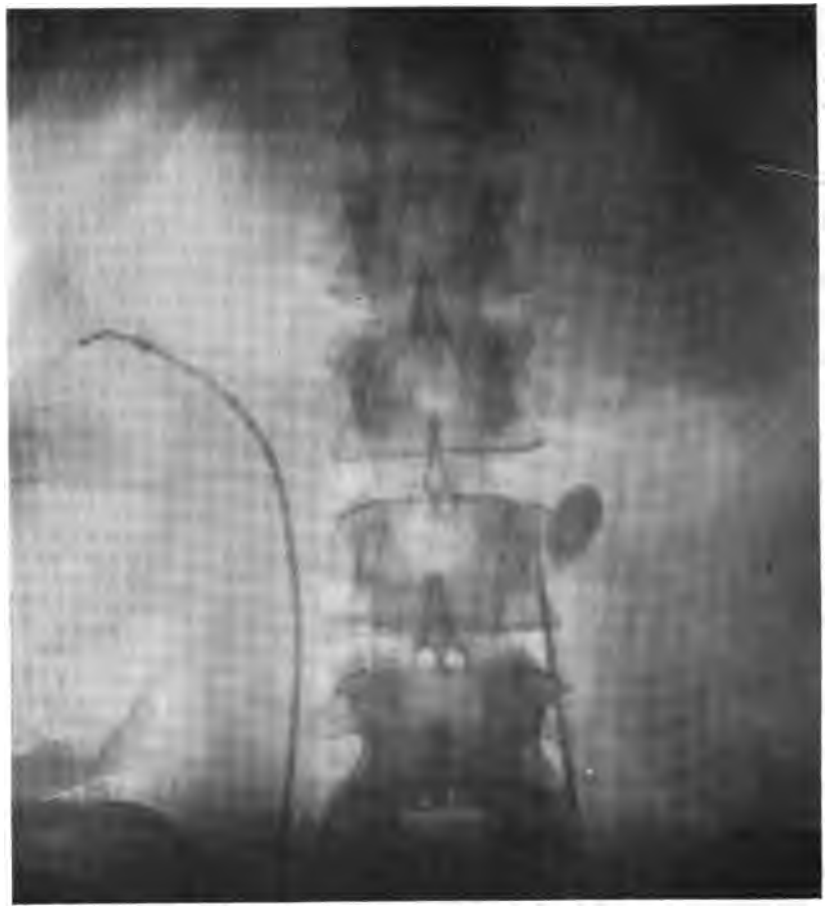

FIG. 2. EXTENSIVE DESTRUCTION RIGHT KIDNEY BY TUBERCULOSIS. THE STONE IS SEEN LYING FREE IN THE PELVIS

was clear, persistently alkalin, of normal gravity, and repeated examination showed only an occasional red cell, a few leucocytes, and triple phosphate crystals. Tubercle bacilli were never found in the urine. Physical examination showed nothing of note except a mass in the

right upper quadrant of the abdomen. The report of an X-ray examination, made on February 21, is as follows: Examination of the gall-bladder region shows no abnormality. Examination of the urinary tract shows two shadows of calcified bodies; one on the right side and one on the left. The one on the left side is about the size of a navy bean, and is probably a stone in the pelvis of the left kidney. The one on the right side is about three cm. long and 1.5 cm. wide and is on a level with the third lumbar vertebra and close to it. This has the appearance of a stone in the right ureter, or possibly in the pelvis of an enlarged and displaced right kidney. There is an indefinite shadow on the right side which may be that of a much enlarged kidney. Final diagnosis in this case should be made after catheterization of the ureter (Christie).

Such were the data obtained previous to our visit. Examination of the abdomen showed a large mass in the upper right quadrant, firm but elastic, smooth, and not very tender. It reached the mid-line in front, extended slightly below the level of the umbilicus, and disappeared beneath the right costal border. Tympany was present over the mass in front. On bimanual examination it was slightly but definitely movable. It was thought to be an enlarged kidney, but the exact nature of the swelling was not apparent.

Double ureteral catheterization with X-ray catheters was done. The left catheter passed easily to the pelvis, and clear urine was obtained, free from infection but containing a few red cells, and corresponding in character to the catheterized bladder urine. The right catheter passed a distance of 26 cm. meeting an impassable obstruction. No urine could be obtained from this side. An X-ray examination was made with the cystoscope and catheters in place. The plates show the tip of the left catheter close to the stone which is undoubtedly in the left pelvis. The tip of the right catheter passes along side the stone for a distance of about one-half its vertical diameter where further progress was arrested.

It was apparent that the stone on the right side was producing complete obstruction of the right ureter at its junction with the pelvis. As no secretion could be obtained from this side, we were unable to determine the nature of the tumor, but it was unquestionably connected with the right kidney.

Operation, March 9, 1920. At operation the stone was readily felt deeply behind the greatly enlarged kidney. While palpating the stone, it slipped suddenly away from the finger, upwards into the pelvis. The

mass was then freed from its bed, delivered, and excised. It was not until the greatly enlarged and manifestly diseased kidney was excised and sectioned that we had a clue as to its pathology. It presented multiple typical tuberculous abscesses, involving the pyramids. These abscesses were filled with thick pus and caseous material. There was no deposit of lime salts. The stone, previously felt, was lying free in the pelvis. Convalescence was unusually smooth and rapid. The patient left the hospital on the thirteenth day, with the wound solidly healed.

The pathologist reported as follows: There is almost complete destruction of the parenchyma with a pronounced granulomatous increase of the connective tissue elements. Sections show masses of chronic tuberculous granulation tissue with considerable necrosis among which are many ill-defined tubercles. In the most distal parts of the cortex a few glomeruli and uriniferous tubules are present, but all show considerable round cell infiltration and encroachment of the tuberculous process. All the tuberculous mass is apparently encapsulated, no perinephritic tuberculous lesions being found.

Remarks. This is the first instance I have observed of renal tuberculosis complicated by a true stone in the same kidney. I assume the condition is unusual and relatively rare. In this case the fact that the stone was impacted, producing complete obstruction of the ureter, adds further interest from the standpoint of diagnosis. By reason of the occlusion we were unable to obtain any secretion from the right kidney, and were unable, therefore, to determine the nature of the tumor mass before operation. The real pathology was not suspected until the excised kidney was examined.

The calculus was the size of a large bean, greyish white in color, with a rough surface.

It appears most probable that the calculus formation preceded the infection with tuberculosis. We know, for instance, that three years previously examination by X-ray and ureter catheter showed a calculus in the right kidney larger than the recurrent stone on the left side. This calculus had doubtless been present for a considerable time. The symptoms at that time were those of renal lithiasis. No mention is made in the history of tuberculosis having been found or even suspected. There had been no bladder symptoms, and none developed later. It is more than likely that infection of the bladder would have occurred from an

active focus in the kidney in a much shorter time. It was seventeen months after this examination that she is said to have had influenza and began to lose weight rapidly. It is probable that infection of the kidney with tuberculosis occurred at this time. Impaction of the calculus doubtless occurred nine months later with the onset of the severe symptoms suggesting occlusion of the ureter. This probably accounts for the fact that the bladder escaped infection as well as the rapid destruction of the kidney by the tuberculous infection.

I have made no search of the literature for the report of cases of renal calculus and tuberculosis occurring in the same kidney. In his chapter in Modern Urology O'Neil says, "While undoubted instances of simultaneous occurrence of renal calculus and renal tuberculosis, and the development of renal tuberculosis in a kidney previously the site of calculus, are found in the literature, the conditions are rare." In 256 cases of renal calculus and renal tuberculosis reported from the records of the Massachusetts General Hospital, no cases of true calculus were found in tuberculous kidneys as opposed to the calculous deposits, nor were there any cases of the development of tuberculosis in kidneys from which calculi had been removed (O'Neil).

In their paper on Roentgenographic Diagnosis in Renal Tuberculosis, Braasch and Olson state that "Actual stone formation is rare in tuberculous kidney. When it does occur it is generally a phosphatic stone, formed in a localized abscess with necrosis and secondary infection. . . . . It may be inferred that primary stone formation is unusual in patients with renal tuberculosis."

Present illness. Readmitted to the West Surgical Service December 12, 1919. Inguinal sinus has drained more or less constantly since May. About a week ago noticed numbness of feet and legs with weakness. This has progressed so that patient is now unable to walk. Owing to this condition, which at time of entrance was the predominant feature of the case, one of us (W. J. M.) was asked to study the patient from a neuro-surgical standpoint.

Physical examination. Heart and lungs negative. Abdominal examination negative except for sinus in left groin just above Poupart's ligament. This sinus drains thin pus, the drainage being increased by pressure over left kidney. Scrotum red and tender. Perineum red and brawny with one or two small fistulae. Calibration of urethra shows multiple strictures. Neurological examination—Cranial nerves and upper extremities negative. Incontinent of urine and feces at times. Voluntary movement of all muscle groups of both legs, but marked general weakness and considerable involuntary twitching. Tendon reflexes lively and equal. Right clonus and Babinski. Left pseudo-clonus not sustained. Left plantar normal. Cremasteric and abdominal reflexes absent. Epigastrics equal and active. Sensation definitely diminished to brush to tenth or eleventh dorsal vertebra. Pinpoint exaggerated and suggests "electric shock." Upper level not sharply defined. Saddle area of increased anesthesia about tip of coccyx. Spine shows prominence of eighth and tenth dorsal vertebrae. No limitation of motion, no pain. Blood pressure 148/80.

Lumbar puncture (by Dr. James B. Ayer). Clear colorless fluid. Pressure 160 mm. After 5 cc. withdrawn pressure 120 mm. Pulse and respiratory oscillations normal. Protein (alcohol) ±, Nonne negative. Sugar none, cells none.

Blood Wassermann negative. Spinal fluid moderately positive.

X-ray of spine on two occasions shows no evidence of Potts' disease, thus confirming a previous orthopedic opinion.

X-ray of kidneys shows a large shadow which has the same shape as pelvis of kidney on the left side (fig. 1).

January 2, 1920. Neurological condition somewhat improved since admission three weeks ago.

External urethrotomy (J. D. B.) with excision of sinuses and scar tissue and drainage of a large perineal abscess. Wound closed in with plastic flaps. Perineal drainage.

January 18, 1920. Good convalescence. Myelitis still improved. Perineal wound nearly closed.

Cystoscopy (J. D. B.) shows essentially normal bladder mucosa. Right ureter normal and admits no. 6 catheter to kidney. Urine clear, sediment negative, phthalein appears in 4½ minutes (intravenous) with

FIG. 1

30 per cent in 1000 cc. in fifteen minutes. Left ureter retracted, contracted, red and edematous. Catheter will not engage in its orifice; no jet seen. Nothing to suggest either a third ureter or a fistulous opening in the bladder.

Bladder urine cloudy, acid, 1012, albumen, slight trace, no sugar. Sediment shows much pus and an occasional red blood cell. White count various from 12,000 to 26,000. Hgb. 80 per cent.

January 27, 1920. Transferred to the Genito-Urinary Service. Left nephrectomy (J. D. B.). Kidney large, thin walled, filled with pus and remarkedly adherent so that it was torn in several places during delivery which was of necessity intracapsular. Ureter much thickened, indurated and adherent. Parallel to and internal to it there was another structure of about the same size and consistency which looked and felt much like a second ureter, but lined with grayish granulation tissue. A finger could be inserted down this tract in the direction of the groin, and upward to the kidney pelvis where a large stone could be felt. During the delivery of the kidney many small pieces of stone escaped.

Pathological report (Dr. James Homer Wright). "Pyramids and calices are represented by cavities bordered by inflammatory material. Pelvis is dilated and tissue about it porky and inflammatory. Bloody to purulent fluid bathes cavities. Microscopic examination shows appearance of tuberculosis." Unfortunately the specimen was presented to the Pathologist minus the calculus and with no statement as to its unusual features. From our own observation of the calculus, at the time of operation we are positive that it was not simply an incrustation of the renal pelvis with lime or phosphatic salts, nor was it an area of calcification so commonly seen in cases of renal tuberculosis.

February 3, 1920. Discharged relieved. Patient was in a precarious condition for some days after operation. Perineal wound practically closed. Kidney wound closed except for a small granulating area. Inguinal sinus closed. Patient can now use his legs fairly well and sensation is returning.

Patient has reported to us twice in the past few weeks. Has gained 15 to 20 pounds weight, feels strong and well. Perineal wound entirely closed, sounds to 28F. passed easily. Kidney wound still discharging a small amount from one sinus. Inguinal wound entirely healed. Can walk an almost unlimited distance without cane or crutches and with no fatigue. Sensation now practically normal. Sphincters normal.

It will be noted that although this patient was under more or less constant observation since October, 1915, both in the Out-Patient Department and in the House and was seen by several

different House Officers and surgeons there was nothing at any time to arouse the suspicion of renal tuberculosis or, in fact, of any kidney lesion. He also furnishes another example of the silence of renal calculus.

It is certainly remarkable that an inflammatory condition of the kidney and its pelvis as well as of the perinephritic tissues giving rise to an inguinal fistula should not also have called the attention of the patient, if not of the surgeon, to its presence at one time or another. Bladder symptoms were conspicuous by their absence or mild character. Those which did occur might well have been occasioned by the strictures of the urethra.

Repeated examinations of the chest and of the sputum for over three years failed to show any evidence of lung tuberculosis, although we realize that the tubercle bacillus may reach the kidney without demonstrable evidence of lung involvement.

At first, owing to the presence of a sinus in the groin, apparently due to a psoas abscess, a tentative diagnosis of Pott's disease with pressure on the cord was made. This diagnosis soon became untenable owing to the absence of other signs of Pott's disease and negative X-rays of the spine.

We have never seen transverse myelitis as a complication of renal sepsis of any sort, much less of renal tuberculosis. A careful search of the recent literature has thrown no light on the subject while as an accompaniment of renal disease it is not even mentioned. It seems to us that two theories may be advanced to explain the presence of a transverse myelitis, firstly a direct extension of the septic process to the epidural space, and, secondly, myelitis of toxic origin. The fact that the upper level of the myelitic process was at the tenth or eleventh dorsal segment (seventh or eighth dorsal vertebra) is hardly compatible with a direct extension of the process, unless it were of considerable extent in the epidural space. This seem unlikely as the process began to clear up after rest in bed, and drainage of the sinus and of the bladder, without any evidence of pus in the bony canal and the cerebro-spinal fluid showed no evidence of such a process.

Toxic myelitis is a well recognized condition, although far from common, and the text books tell us but little of its origin. It

is occasionally seen during pregnancy, various acute and chronic diseases, probably also as the result of lead or alcohol poisoning, and possibly from exposure to wet and cold. Such a process would tend to clear up quickly as in the case under discussion.

As regards the presence of calculus in a tuberculous kidney all we can say is that it is uncommon. We have been unable to find any statistics in the literature. Morris contents himself with the remark that "it must be remembered that a calculus may be present in a tuberculous kidney." Our own experience in private and hospital cases, combined with that of several of our colleagues, with whom we have discussed the subject, has shown that we can muster perhaps a half a dozen cases of true renal calculus complicating tuberculosis. All of us have seen numerous examples of calcified areas in a tuberculous kidney. We are certain, however, that in the case here presented, an actual calculus was present as shown by its shape, its position in the renal pelvis, its smooth surface and its mobility.

So far as we can ascertain this is the first case of inguinal renal fistula ever seen at the Massachusetts General Hospital. We have accordingly made a careful search of the literature and find an almost equal paucity of material.

Henry Morris says that "a (kidney) fistula may open in one of several directions, namely at the loin or groin, into the colon, duodenum, or stomach, into the pleural cavity or lung, or into the peritoneum. Generally there is but a single opening into the cavity of the kidney or ureter, and that is upon the posterior aspect." He further states that there are "many cases on record of urinary fistulae communicating with the kidney and opening externally in the loin or groin through which calculi have been discharged spontaneously or removed by the surgeon," and he also remarks that "tuberculous disease of the kidney is a very pregnant cause of this troublesome condition."

"In a collection of unselected cases of fistula due to renal calculi some of the fistulae followed the bursting of the pyonephrotic kidneys, and others were the result of perinephritic suppuration and the bursting of an extra renal abscess. . . . " Of those which opened on the external surface of the body only "one or two" opened in the groin.

Sir Frederick Treves mentions renal fistulae in his Manual of Surgery published in 1892, but evidently regards them as a distinct rarity.

Rollin, in his Thèse de Paris, 1889, states that fistulae of renal origin have been described in ancient medical literature, his review of which is most interesting reading. He refers especially, as all of us must, to the monumental work of Rayer, published in 1839, in which a number of cases of spontaneous renal fistulae are recorded and illustrated. Among this number we were unable to find a case of inguinal renal fistula similar to ours. It is obvious, however, that since Rayer's time, thanks to advances in diagnosis and treatment, renal fistulae have become far less common. Rollin was able to collect but 37 cases of more or less contemporaneous date, of which, it is worth noting, only one resembled ours in its manner of opening into the groin.

Chazet, in a Thèse de Paris of 1900, collected 12 cases of renal tuberculosis with fistula formation. He found, as did his predecessors, that such fistulae occurred mostly in the lumbar region in the triangle of Petit. In one case the fistula opened on the inner aspect of the thigh at the level of the lesser trochanter.

Michaud, in his Bordeaux thesis, published in 1912, has reported several cases of transperitoneal renal fistulae and gives a very complete bibliography of the subject in general.

It is obvious from our reading of the scanty literature of the subject and from our careful search for additional material, that renal fistulae, other than those of traumatic or post-operative origin, have become rapidly and progressively less common, so much so that we have not found reference to a single case in the literature for over twenty years.

When one peruses the literature of an older generation when "renal surgery was the order of the day" (Rollin) one finds many references to renal fistulae either as a preoperative complication or as a postoperative result. It is encouraging, therefore, to realize that owing to the greater tendency of patients to seek earlier relief for their ills, to more accurate and earlier diagnosis, and to better surgery, what was once a not uncommon condition has become practically extinct.

SOLITARY CYSTS OF THE KIDNEY

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Large solitary and multiple cysts of the kidney are rare, and as evidence of this statement the following data are presented:

1. The literature dealing with this condition is not large and case reports are few and far between. To illustrate: In 1906 Simon was able to find but 52 cases reported in the literature. Isolated cases have been reported since then—47 according to my knowledge, and with the case reported here the number, since Simon made his report, is 48.

2. This condition is infrequently met with during operations upon the kidney. Israel found it only once in 297 surgical conditions of the kidneys. Cunningham, who presented a paper on this subject before this Association in 1916, reported 4 cases upon which he had operated.

3. Autopsy statistics also prove that it is a rare finding in the postmortem room. According to Morris, 5 cases were found in 2610 autopsies at the Middlesex Hospital, London. Eleven of the 47 cases reviewed in this paper were found at autopsy.

Congenital polycystic disease and the small cysts met with in chronic nephritis are not to be confused with the large solitary cysts, as has been done by some authors. These lesions will not be considered in the discussion at this time.

Because of the infrequent occurrence of solitary cysts of the kidney, the following case is not without interest.

W. K., male, aged fifty-seven. Referred by Dr. Don Abbott.

Previous illnesses. Typhoid fever and scarlet fever many years ago; an attack of rheumatism eight or ten years ago; three attacks of gonor-

rhea in his twenties (no complications); evidently made a complete recovery from these attacks. Operation for removal of part of the uvula at twenty-six.

Present illness. Four months ago, at which time he was stretching and rubbing his abdomen, patient felt a mass in the lower right quadrant which seemed to be inside the abdomen; tenderness and pain absent. Mass was hard and could be moved around without pain and could always be felt. Mass has somewhat increased in size since first being noticed. Previously, patient had noted nothing wrong. Also complained of a slight ache in the lumbar region, which has been present on and off for years.

Bowel distress. For the past several months patient has had some bowel distress, complaining chiefly of the presence of gas in the bowels and of some constipation.

Prior to the accidental discovery of the mass, patient had been in good health without ache or pain. For two or three years it had been necessary to void once or twice at night. However, this symptom had not been very marked and had given him but little concern. No increased frequency during the day.

Family history. Father died of kidney trouble at seventy-one; nature of the kidney trouble unknown to patient. Mother died of dropsy when young. One brother living and well. Wife and two children living and well; no history of miscarriage.

Physical examination (Dr. Don Abbott). A slightly plethoric, middle-aged white male, appearing and feeling well. Scalp, nose and ears: negative. Left pupil: sluggish reaction to light; right pupil: larger than left and regular in outline; good reaction to light. Uvula—scars and puckering. Teeth: many fillings and some pyorrhea. Tonsils: moderate in size and boggy. No râles in lungs. Heart: aortic second greater than pulmonic second. Spleen and left kidney: not palpable. Liver: sharp and indurated; not tender. In the right lower quadrant of abdomen a hard, smooth and only slightly irregular mass which moved with inspiration and expiration; not tender; firm in consistence; readily movable. Reflexes lively.

Rectal examination (H. L. Kretschmer). Prostate symmetrical, smooth and slightly increased in size.

Examination of blood. Erythrocytes 4,240,000; leucocytes 9,000; hemoglobin 77 per cent. Blood pressure: systolic 225; diastolic 130. Wassermann reaction negative.

Roentgen-ray examination (fig. 1). Left kidney outline visualized and extends down to the level of the upper margin of the third lumbar vertebra. Psoas muscle outline on left side visible in its entirety. On the right side is seen a large, rounded area of the same general density as the kidney outline on the left side, which extends downward

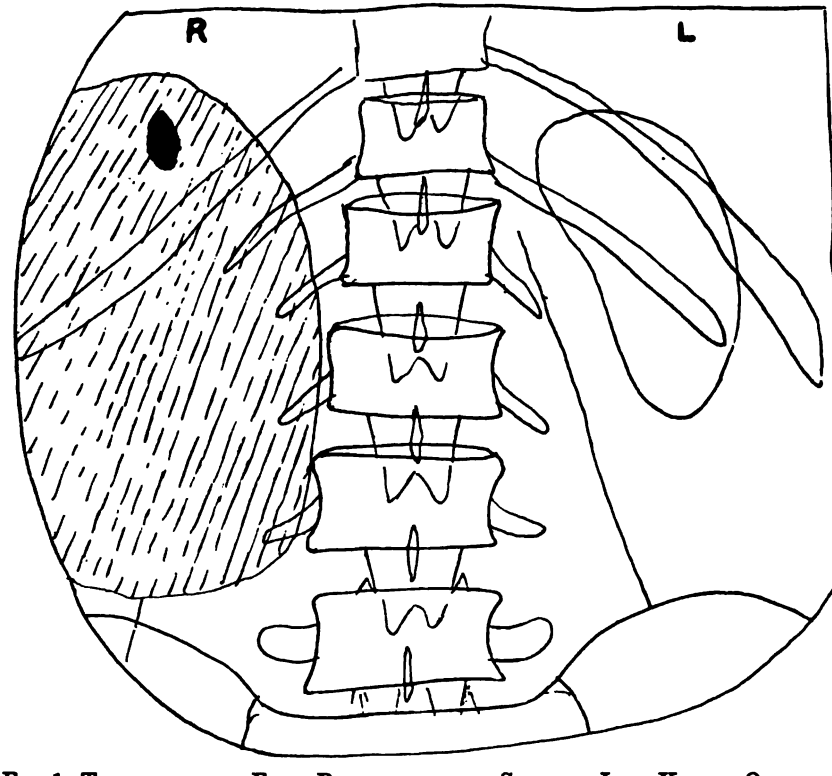

FIG. 1. TRACING OF THE FIRST ROENTGENOGRAM SHOWING LEFT KIDNEY OUTLINE OF THE LARGE CYST AND PRESENCE OF A CALCULUS

to the upper border of the fourth lumbar vertebra, just beyond the spinal margin mesially, and to the outer border of the plate. The transverse processes of the spine on the right side are not easily visible, being covered by the presence of the above-mentioned shadow. A small amount of psoas muscle visible just below this shadow and above the crest of the ilium.

In the upper part of this shadow is a shadow that corresponds in its location to a calculus in the renal pelvis. A second plate made in the region of this shadow shows a more distinct shadow located between the eleventh and twelfth ribs, which was diagnosed as a renal calculus.

Cystoscopic examination. There was some difficulty in introducing the cystoscope because of an obstruction in the prostatic urethra. Internal urethral orifice irregular in outline, especially on the right side, showing a small amount of prostatic tissue protruding into the field. Trigonum fluffy; generalized trabeculation; ureters reached with difficulty because of the prostatic enlargement; ureters catheterized without difficulty or obstruction. Examination of urine obtained by ureteral catheterization showed the following:

RIGHT KIDNEY	LEFT KIDNEY
Clear	Clear
Acid	Acid
Few leucocytes	No leucocytes
Cultures sterile	Cultures sterile

Pyelogram. Forty cubic centimeters of a 15 per cent solution of thorium nitrate were used. This showed the pelvis of the right kidney to be situated opposite the second lumbar vertebra; pelvis somewhat enlarged. Above and overlapping the pelvis was a large, irregularly shaped cavity, the shadow of which was more dense than the rest of the pyelogram, indicating the presence of a larger volume of thorium solution. This cavity extended from the eleventh rib, near its upper margin, to below the twelfth rib. It was in this position that the shadow of the calculus was shown. The outline of the ureter could be seen running across the bodies of the second and third lumbar vertebræ, being displaced mesially by the large cyst.

Operation (December 2, 1919). Under general anesthesia an incision was made in the right lumbar region, cutting skin, fascia and muscles. After bluntly pushing away the retroperitoneal fat, a mass with a smooth surface came into view, ovoid in shape. This mass was found to be attached to the lower pole of the right kidney. Attempts to deliver the kidney and the large mass in toto failed, because of the short distance between the lower costal margin and crest of the ilium, and also because of the enormous size of the cyst. In the attempt to deliver the kidney and large cyst, the latter broke, and this was accom-

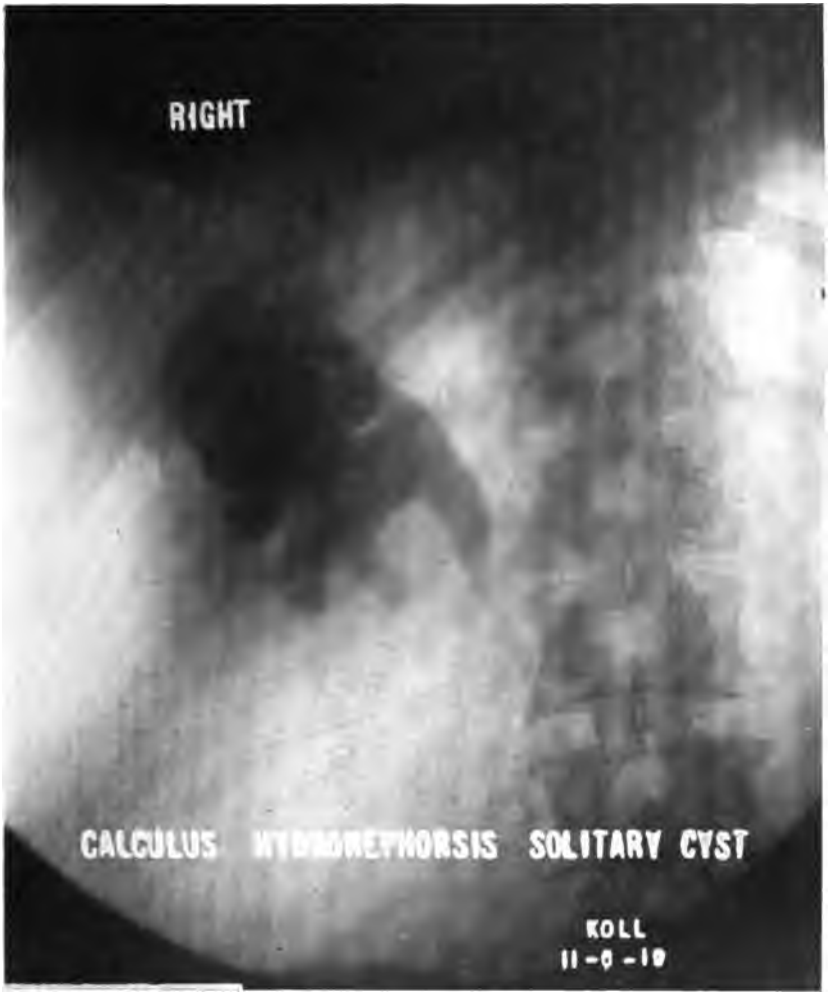

FIG. 2. PYELOGRAM SHOWING A DILATATION OF THE UPPER HALF OF THE PELVIS

panied by the escape of a *brownish fluid* together with *old blood clots.* The cyst was about three or four times the size of the kidney. A second cyst, about 1 inch in diameter, was seen in close proximity to the large cyst. Three smaller cysts were seen in the lower half of the kidney (fig. 3). A stone could be felt in the renal pelvis.

FIG. 3. SHOWING THE LARGE CYST SPRINGING FROM THE LOWER POLE OF THE RIGHT KIDNEY AND THE PRESENCE OF FOUR SMALLER CYSTS

It was decided to resect the large and small cysts. During dissection, one of the larger blood vessels was injured, so that a rather sharp hemorrhage occurred. It was then decided to perform a nephrectomy. Two kidney clamps were placed upon the pedicle and the stump ligated distal to the clamps after the kidney was removed. Iodoform gauze was packed about the clamps and the wound closed by suturing the muscles with catgut and the skin with silk. Clamps removed at the end of fifty-four hours.

Postoperative course. 1. Hiccough. On the fifth day after operation, the patient developed hiccough, very severe and distressing, lasting for three days.

2. Following the hiccough, patient was very much confused, confusion lasting for a few days.

3. Following the operation there was a marked decrease in patient's blood pressure. The following readings were obtained:

December 29, 1919: Systolic, 160; diastolic, 90.

February 26, 1919: Systolic, 190; diastolic, 110.

April 10, 1920: Systolic, 170; diastolic, 100.

Urinalysis (after operation). Pale amber in color; acid; trace of albumin; sugar and blood negative. Many amorphous urates. *Urinalysis* (just before leaving hospital). Straw-like in color; acid; specific gravity, 1020; albumin, blood and sugar negative. A few epithelial cells; a few leucocytes and amorphous urates.

Gross description. Specimen is a kidney with about the normal weight of renal tissue; rather elongated and narrow. To the lower pole is attached a smooth spherical mass about three or four times the size of the kidney, brown in color. There are three other fluid-containing masses, the largest of these not over 6 cm. in diameter. *These cysts contain a clear, yellow fluid, but the largest one is full of flocculi,* a lot of fibrin and blood pigment. On opening the kidney, a double pelvis is seen, each separated by renal tissue. In the superior pelvis, lying in a pocket behind, is a black cockle-bur stone about 1.5 cm. in diameter. The cortex of the kidney is about 6 cm. in diameter.

Histological examination. Some of the glomeruli showed an increase in the nuclei of the malpighian tuft. In others there was a marked thickening of Bowman's capsule. Here and there were glomeruli in which the malpighian tuft had been replaced almost entirely by fibrous tissue.

There were many areas of round cell infiltration in practically all of the sections examined. Some sections showed an increase in the interstitial connective tissue.

The cyst wall was made up of fibrous connective tissue, no lining cells being seen. The adjacent kidney tissue appeared to have undergone a slight amount of pressure atrophy.

DISCUSSION

A diagnosis of beginning hypertrophy of the prostate was made from the cystoscopic examination.

From the physical examination it was believed that the large mass in the abdomen had its origin in the right kidney. The mass was evidently attached to the kidney; it moved with respiration; and when one hand was placed on the loin and one hand over the tumor, a sense of ballottement was obtained.

The roentgen-ray examination showed a shadow, which from its shape and position was interpreted as a stone in the renal pelvis, hence the diagnosis of nephrolithiasis. A round shadow was also evident, which in its contour and position corresponded to the large tumor mass that could be demonstrated by palpation (fig. 1).

One point that remained in doubt was the nature of the tumor. Because of the patient's age, the size of the tumor mass, the absence of subjective symptoms, the presence of enlargement on one side only, and also because of the frequency of a tumor at the patient's age, a provisional diagnosis of tumor (probably hypernephroma) was made. *But the pyelogram was not that usually seen in tumor.*

In the differentiation, the only other kidney condition considered was the possibility of a hydronephrosis. The points that lent color to this view were the following: the smooth surface of the tumor and the fact that ballottement could be elicited rather seemed to favor a tumor containing fluid. But the pyelogram did not correspond to that seen in large hydronephroses.

It was difficult to explain the presence of so large a hypernephroma without its being more or less fixed, and this tumor, as stated above, was freely movable. Likewise it was difficult to understand why so large a hypernephroma should not have produced more systemic disturbances, such as loss of weight,

anemia, or possible evidence of metastases. A polycystic kidney was excluded because of the unilateral lesion and solitary cyst because of its extreme rarity.

A casual review of similar cases in the literature shows that error in diagnosis is not uncommon in solitary cyst of the kidney. The cases in which a preoperative diagnosis was made are very few. Thus, Haenisch made a positive diagnosis of cyst of the kidney, his diagnosis being based on the roentgen-ray findings. Bockenheimer, in his case, made a preoperative diagnosis of benign cystic tumor. His patient was a boy eight years old, admitted to the hospital with a tumor of the kidney as shown by the roentgen-ray, and the examination left no doubt as to the nature of the tumor (benign cystic), since there was distinct fluctuation. These two cases are the only ones that I have found in which positive roentgen-ray findings are recorded and in which a correct preoperative diagnosis was made.

Le Fur made a preoperative diagnosis of blood cyst of traumatic origin and this was verified by operation. In both of Wulff's cases the roentgen-ray findings were negative.

Solitary renal cysts have very frequently been mistaken for lesions of other abdominal viscera. In quite a few instances the pathology was correctly associated with the kidney, although a correct pathological diagnosis was not made, as in the case reported in this paper. The following preoperative diagnoses were made: Tumor or unilateral hemorrhagic nephritis (Wulff); tumor (Wulff); hydronephrosis and ptosis (Maguini); intermittent hydronephrosis (Vogel); movable kidney with tumor (Fowler); hypernephroma (Schulman); tumor (Guilini); rupture of kidney (Lipskeroff); stone in kidney (Cunningham).

Cassioli made a preoperative diagnosis of ovarian cyst, hydatid of liver, or suppuration of kidney, and Chiasserini, ecchinococcus or hydronephrosis.

Not infrequently the condition has been confused with large ovarian cysts; a frequent error in diagnosis that has been reported. In 5 of the 47 cases reviewed, a diagnosis of ovarian cyst was made, as recorded by Engländer, Blanchard, Purslow, Boldt, Sarkissiantz and Cunningham.

A preoperative diagnosis of a lesion of the gall-bladder was made by Cunningham, Vogel and Lund.

In several instances the lesion was diagnosed as renal with no record in the reports of just what type of lesion was suspected before operation, and in a large number no preoperative diagnosis was made.

Among the rare intra-abdominal lesions diagnosed, we find intraperitoneal cysts (Paus) and mesenteric cyst (Bevers). Enlargements of the spleen and tuberculous peritonitis have been mistaken for large cysts of the kidney. When the tumor on account of its size, interferes with the action of the bowels, symptoms of intestinal obstruction may be present.

ETIOLOGY

As regards the etiology of this condition, nothing definite is known. Reference to the various theories will be made in passing, but a discussion of these theories will not be entered into in detail, since this was in a thorough manner done by Caulk in his paper, read before this Association a few years ago.

In a discussion of these cases a tendency is evident to include the small multiple cysts of the kidney, which are seen in lesions such as chronic interstitial nephritis, arteriosclerotic kidney, etc., but a line of demarcation should be drawn between these lesions and the large solitary and multiple cysts under consideration in this paper.

As to the formation of these cysts, a congenital theory has been advanced by a large number of authors, while others see a relationship in the etiology between them and the polycystic kidney. Caulk says: "Those who contend that all kidney cysts are of congenital origin are unquestionably making a statement which is unjustifiable."

Many authors have advocated the so-called retention theory, believing that the cysts are due to retention and that this retention is due to an obstruction. Caulk is of the opinion that the majority apparently belong to the class of retention cysts, following obstruction.

Cunningham states that the large, solitary, serous cysts producing abdominal symptoms are very uncommon and are probably due to some undiscoverable obstruction in the uriniferous tubules and the continued excretion of urine. He also states that they are generally unilateral and are considered large retention cysts by those who have studied the subject.

SYMPTOMS

Because there is no symptom or symptom-complex characteristic of solitary cysts, the infrequency of a preoperative diagnosis can readily be understood. Among other reasons are—

1. The rarity of the condition, hence the possibility of its presence not being considered in the differential diagnosis.

2. The fact that by far the largest number of cases reported in the literature were noted before the advent of our present accurate methods of urological diagnosis.

Age. Solitary cysts of the kidney occur most frequently after thirty, being a disease of adult life. Very few cases have been recorded before thirty, although isolated cases have been reported in very young children. Albarran and Imbert state that the youngest case in their series was sixteen months old. In Zaccarini's case the age was mentioned as three years and in Beneke's case, four and a half years. In the cases embraced in this paper, the following age notation was found:

	Cases
1 to 10 years	3
11 to 20 years	1
21 to 30 years	2
31 to 40 years	10
41 to 50 years	3
51 to 60 years	10
61 to 70 years	10
71 to 80 years	3
Age not stated	6
Total	48

It will be seen that of the 42 cases in which the age was stated 36 occurred after the age of thirty.

Sex. It has frequently been stated that solitary cysts of the kidney occur more often in the female than in the male. Brackel, in a series of 21 cases, found that the disease occurred 14 times in females. Albarran and Imbert, on the other hand, noted its occurrence 13 times in males and 10 times in females in cases studied since 1890 In this series the conclusions reached were females 22, males 20, sex being unknown in 6 cases. Judging by these statistics the conclusion to be drawn is that the disparity between the sexes is negligible.

Tumor. The presence of an abdominal tumor is the first thing that attracts the patient's attention, premonitory symptoms being often lacking. The enlargement is not always a frankly marked tumor according to Paus, who has reported a "heavy feeling," Beneke and Boldt "increase in the size of abdomen," Brockenheimer "fullness and pressure," Cassioli "enlargement of the abdomen," Cunningham "swelling in the region of the gall-bladder." Despite these observations, definite tumor formation has been noted in a large number of cases. In the case reported in this paper the patient's chief complaint was the presence of a tumor mass which he discovered quite accidentally while stretching. Moreover, Maguini, Engländer, Blanchard and others have noted the presence of a tumor. In 28 cases the presence of a tumor, swelling or enlargement was revealed by palpation.

Hematuria Gross blood in the urine is not a frequent occurrence. According to Wulff's case reports it occurred in 2 cases, in Guiliani's in 2 cases, and it has been reported by Le Fur, Katzenberg, Malherbe, Lipskeroff, Caulk and Cunningham. In Lipskeroff's case the bleeding may have been due to the trauma for which the patient was operated upon, and not to the cyst which was found at the time of operation.

Pain. Pain has been variously described as a dragging pain, heaving pain, pain in the lumbar region and pain that was constant. In some cases pain was described as colicky—the pain of renal colic. The characteristics were those of pain often associated with the more common surgical lesions of the kidney.

Gastrointestinal symptoms. The patient reported in this paper complained of some slight intestinal distress for three or four months before he discovered the tumor or consulted a physician. His complaint was chiefly in regard to gas in the bowels and to some constipation. It would be well to emphasize here that when the tumor reaches an enormous size, its presence may interfere with the action of the bowels and lead to a predominance of bowel symptoms. In Bever's case a great deal of constipation was noted.

Pyelograms. On account of the fact that many reports of solitary cyst of the kidney date back a number of years, before the advent of pyelography, the records show pyelograms only in 1 case, namely Schulman's, who made a diagnosis of hypernephroma after pyelography. In recent times Braasch, in his book on pyelography, shows pyelograms of this disease, but these do not correspond with the pyelogram obtained in this case, due entirely to the difference between Braasch's case and the case reported in this paper. In the case reported here, in addition to the solitary cyst, there was a bifid pelvis and a large stone, the latter having produced enlargement of the upper pelvis.

Associated pathology. The case reported here was characterized by a large solitary cyst and multiple cysts (four in number) and also by a double or bifid pelvis. At operation a single calculus was found in the upper pelvis which was hydronephrotic. Both the calculus and hydronephrotic pelvis was demonstrated roentgenologically prior to the operation. The only case similar to the one reported here, which I have been able to find in the literature, is that recorded by Henry Morris in his book on "Surgical Disease of the Kidneys," with this difference, that his case did not show any changes in the pelvis. Vogel reported a case in which a stone was found in the pelvis, and in one of Cunningham's cases a stone was demonstrated by means of the roentgen-ray. In 2 cases reported, in addition to the cyst, renal tuberculosis was present. In Desnos' case the tuberculosis was found in the upper pole. Sarkissiantz found tuberculosis of the kidney associated with amyloid degeneration and arteriosclerotic changes.

Among other rare associated pathological conditions may be mentioned horse-shoe kidney (Brockenheimer), hypernephroma (Cunningham), and anomalies of the renal blood vessels (Fowler).

DISTRIBUTION

Solitary cyst of the kidney is a unilateral disease, and this is one of the distinguishing points used in differentiating it from polycystic disease, generally admitted to be always bilateral. Simon who reviewed the literature and reported 52 cases in 1906, the largest number of cases collected by any one author that I have been able to find, likewise states that it is a unilateral disease. In this series I was able to find only 2 cases in which the disease was present on both sides and these were reported by Zaccarini and Cunningham. The cysts were found at autopsy. One of the patients was three years of age and was operated upon for irreducible inguinal hernia. The direct cause of death was hypertrophy of the thymus

In the remaining cases only one kidney was involved, the cysts being found in the right kidney 21 times, in the left 20 times, and no mention of which kidney 5 times.

SIZE OF CYSTS

The size of the cysts is variable, expressions such as the size of hazelnuts and walnuts, a child's head, double fist, and large, appearing in the literature. More exact terms have been used: seven months' pregnancy (Boldt) and measurements, 4 litres (Le Fur). The largest cyst was reported by Cassioli who stated that his patient's cyst contained 12 litres.

LOCATION

In 11 cases the cyst was located in the upper pole and in 13 cases in the lower pole. In Fowler's case the cyst occupied part of the lower third and part of the middle third: in Paus' it was situated on the anterior surface, and in Vogel's in the middle of the anterior surface In Le Fur's case the cyst originated

on the anterior surface and in Sarkissiantz's it sprang from the outer border, while in one of Cunningham's cases the cyst was described as springing from the lower pole and hilum.

CONTENTS

In a large number of cases the character of the contents was not stated. In the majority of cases in which mention of the contents was made, the contents were described as clear serous fluid. Bloody fluid or clots occurred in few cases. In one of Wulff's cases the character of the fluid is described as thin fluid and blood, and as bloody in the other case Giuliani stated that clots were found in his case and in Recamier's case the contents were serosanguineous. In Lipskeroff's case the contents were bloody, but this was probably due to the trauma.

In the case reported in this paper the large cyst contained old clotted blood and the smaller cysts, clear straw-colored fluid.

TREATMENT

It is universally agreed that the logical treatment is resection of the cyst, provided that this can be carried out; this is feasible if there has not been too much destruction of kidney tissue.

Nephrectomy must sometimes be resorted to when complications arise during the course of the operation, such as uncontrollable hemorrhage In 16 of the 48 cases included in this paper, nephrectomy was carried out, and in 18 either excision or resection. Eleven were found at autopsy, and in 1 no mention was made of the type of operation. In 1 the sac was sutured to the abdominal wound.

Of the 35 patients that were operated upon, 2 died. In one death was due to bronchopneumonia, in the other, erysipelas. One patient died of peritonitis, but this was probably the result of many tappings. One patient died following an operation for inguinal hernia, death being due to hypertrophy of the thymus. In this case the solitary cyst was found at autopsy.

SUMMARY

1. Solitary cysts of the kidney are rare.

2. They occur with about equal frequency on the right and left sides.

3. The sexes appear to be about equally affected.

4. The cysts usually originate from one pole, either upper or lower.

5. The disease is not commonly met with in the first two decades of life.

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DISCUSSION

Dr. JAMES A. GARDNER, Buffalo, N. Y.: I am interested in the report of Dr. Bugbee's case because I had operated upon a patient expecting to find a hypernephroma. After removing the specimen I was unable to make a diagnosis. When the specimen was examined by Dr. Simpson, Pathologist, at the State Institute for the Study of Malignant Disease, he made a diagnosis of primary carcinoma of the kidney and informed me that only a month before he had seen one that Dr. Bugbee removed. Dr. Simpson stated that they had only seen 3 cases of primary carcinoma of the kidney since the institute was founded. This case of mine was the only case of primary carcinoma I have ever seen.

Dr. W. C. QUINBY, Boston: I congratulate Dr. Bugbee on his splendid presentation of a rare type of tumor. I would also like to call attention to a case reported by Dr. O'Conor of the Peter Bent Brigham Hospital last winter,[1] of a similar tumor primary in the kidney. The outstanding feature of his case was not only the rate type of renal tumor, but the fact that the urine clotted on standing, the clotting being due to fibrin.

Dr. JOHN T. GERAGHTY, Baltimore: I would like to ask Dr. Bugbee if it is possible to exclude these tumor areas in the previous and subsequent pathology of the kidney itself, because I have seen several cases in which primary carcinoma of the kidney was supposed to have originated in the tubules of the kidney, but subsequent examination showed that the tumor originated in the pelvis of the kidney. Tumors arise in the kidney like those in the bladder, except they undergo malignancy, and I would like to know if that was the case.

[1] Fibrinuria: Occurrence in a case of carcinoma of the kidney. Amer. Jour. Med. Sci., May, 1920, clix, no. 5, 729-742.

Dr. BUGBEE (closing the discussion on his part): At the time the kidney was removed there was no growth in the pelvis of the kidney; the entire kidney was destroyed.

Dr. JOHN R. CAULK, St. Louis: I should like to put on record two cases of exceeding interest to me. They have a bearing both on Dr. Fowler's paper and on Dr. Barney's if I may step a little ahead.

The first case was one of a young Mexican girl, sixteen years of age, whom I saw three years ago with bilateral renal tuberculosis and intractable cystitis. The left kidney was more severely involved than the right, although the right gave her the symptoms. The X-ray showed a stone about the size of a hazel nut in the pelvis of the right kidney. Wishing to protect her kidney from destruction, I did a pyelotomy of the right kidney, removed the stone, and made the closure with a fatty fascial flap. The kidney showed an extensive subcapsular involvement of miliary tuberculosis. We exposed the kidney a little while to the air to dry. This woman made a perfect recovery, and has had no leakage at all. She went along, and about a year later came in with an acute secondary infection of the left kidney, the worst kidney. She was very sick, and there was an enormous mass in her left side. We removed this kidney. She did not do very well. In my experience youngsters do not do well with tuberculosis. Her bladder got better. She went home, and I saw her again about three months ago. She came back looking the picture of health but was bothered with bladder distress, yet she was considerably improved. She was again suffering from symptoms in the right side. The X-ray showed a typical stone. I cut down on the kidney, the adhesions being very dense, and in getting into the lumbar aponeurosis found it densely adherent to the kidney. With very gentle manipulation with the index finger I suddenly broke through something, and an enormous spurt of blood came from under the skin. We packed it. I then got a better exposure and delivered easily the lower half of the kidney which was completely torn through into the pelvis. We packed that back and easily got the other half of the kidney. The tuber-

cles on the surface of the kidney, the subcapsular tubercles, were quite healed over. The parenchyma of the kidney looked quite healthy, quite free from involvement, yet we only saw the inner side of the middle of the pelvis. We approximated the two surfaces of the kidney after removing the stone from the kidney, and the girl had a very good convalescence. There was not the slightest leakage of urine, no reaction, no hemorrhage. She is perfectly well.

The points of interest in that case were the association of stone with tuberculosis; recurrence of stone; healing of the pyelotomy incision in the face of tuberculosis; almost spontaneous rupture of a kidney, and cured by suture, showing the wisdom of conservatism in traumatisms of the kidney.

I have another case worse than that. This second case was another girl I saw five years ago. She was 16 years of age at that time. She had an acute enormous involvement of the right kidney with tuberculosis, aside from all bladder symptoms. We removed a large tuberculous pyonephrosis. She did quite well. I lost sight of her for five years. She showed up this year, giving the story that about a month previously the bladder symptoms which for two months had been quite severe, had suddenly improved. Following this, she developed a large mass over her lower abdomen pointing in the region of her left anterior superior spine. This was opened by her doctor and a great deal of pus and urine removed. She has drained all of her urine from this opening since. I thought that possibly she was having a regurgitation from the stump of her old ureter. On cystoscoping, however, I found that this was not the case. The ureter was closed but on the base of the bladder there was a large tuberculous ulcer in the center of which was an opening. In other words, she had had a spontaneous rupture of the bladder at the site of an ulcer. She was suffering extreme pain and tenderness in her left kidney and high fever. A catheter passed up the left ureter showed considerable retention in the kidney. Pyelo-ureterogram showed an extensive dilatation of the ureter and renal pelvis, stricture of the ureter at the uretero-vesical juncture and around this lower ureter was a considerable lime deposit. The

function of the kidney was very low. Filling the sinus tract showed by X-ray that it went retro-vesically to the opening on the posterior wall of the bladder. I did a nephrostomy and tied her ureter with cat gut in order to protect her kidney against destruction and to heal the bladder. She had done nicely since operation but it is too early to predict her outcome. This is the first case of spontaneous rupture of the bladder at the site of a tuberculous ulcer that has ever come under my observation.

Dr. A. H. CROSBIE, Boston: I should like to ask Dr. Fowler if he has seen any theories advanced as to why stones do not form in a tuberculous kidney. I have always had the theory, but I have no special foundation for it, that it was due to persistent acidity of the urine in a tuberculous kidney. In the kidneys with stones, without even an acute infection, patients are apt to have an alkaline urine.

Dr. H. L. KRETSCHMER, Chicago: I should like to place on record the case of a patient in whom we made a diagnosis of both renal tuberculosis and renal lithiasis, before operation.

A woman came in with the usual symptoms of bladder tuberculosis, and tubercle bacilli were demonstrated in the urine. The cystoscopic picture showed typical tuberculosis of the bladder. Catheterization of the ureters showed infection in the right kidney. Roentgen ray examination showed the presence of a definite shadow in the region of the right kidney, and from the presence of this shadow we made a diagnosis of primary stone. This was verified at operation. Examination of the stone showed the presence of uric acid stone.

Dr. JAMES A. GARDNER, Buffalo, N. Y.: I should like to put on record a case of tubercular kidney in which the kidney was totally destroyed and contained 17 calculi. The patient was a trained nurse who had scarlet fever and had been under the care of a competent practitioner. She complained, from time to time, of an irritable bladder. He had examined her urine and chemically found that she had albumin. He felt that this was a sequelae of her scarlet fever. Her bladder symptoms did not

clear up although she was able to work all the time. Five years after her scarlet fever he referred her to me for examination and we found her urine from the left kidney to contain tubercle bacilli. An X-ray examination showed the left kidney to contain multiple calculi. Upon removal of the kidney it was found to be tuberculous, totally destroyed and contained 17 calculi.

Dr. WILLIAM F. BRAASCH, Rochester, Minn.: It may be quite difficult to differentiate between actual stone formation in the kidney and calcareous caseous degeneration occurring with tuberculosis. A good example of this was seen in the case operated at St. Mary's hospital this morning. The roentgengram showed a distinct shadow of what appeared to be a stone, but it was impossible to determine on clinical examination whether it was due to lithiasis or calcareous caseation. I have repeatedly seen shadows caused by caseation with tuberculous kidneys and stone which could not be differentiated. Particularly where there are multiple soft stones in an atrophic kidney is the roentgengraphic differentiation difficult from caseated occluded renal tuberculosis.

I wish to report two cases in which nephrectomy was done for tuberculosis and the patient subsequently passed stones from the other kidney.

Dr. JOHN T. GERAGHTY, Baltimore, Md.: It has been my experience in tuberculosis of the kidney that we have a stone or stones which frequently have nothing to do with the tuberculous process. We have two types of stones in tuberculous kidney. First, caseation, formed in a tuberculous cavity around the margin; then we have there a formation which gives rise to a large shadow, and on exploration we find we are dealing with a true stone, but it is like putty, and it can be curetted out. At first, we did not recognize what these cases were. We have had three such cases. These cases subsequently proved to be tuberculous. There was some evidence at first that the kidney was tuberculous or represented healed tuberculosis apparently, with subsequent infiltration, and the pus becoming infiltrated with the sand you got a large putty-like stone.

Dr. FOWLER (closing the discussion on his part): It would appear from the discussion that the condition is not so rare after all as we may have thought, namely, stone and tuberculosis occurring in the same kidney. However, the case we had the opportunity of studying presented a very interesting feature in that the stone, after a sojourn in the kidney for a considerable length of time, became impacted, after which a mass developed in the side, the nature of which we were unable to determine on account of a closed pyonephrosis, in which the closure was produced by the impacted stone.

In reference to Dr. Crosbie's question, I have not had an opportunity of looking up the literature. The question arises, why in a case of tuberculosis calculus does not develop more frequently or, on the other hand, why in calculous disease we do not find tuberculosis oftener? As a matter of fact, the literature would lead one to believe the two conditions are not commonly associated. The discussion has given us the impression that it is not after all so very rare.

President SQUIER: Dr. Barney is anxious to have the discussion on his paper opened by a neurologic surgeon and, since Doctor Adson of the Mayo Clinic is present, I am going to call upon him.

Dr. A. W. ADSON, Rochester, Minn.: I am particularly interested in what Dr. Barney said relative to complications following tuberculosis of the kidney. I have never known myelitis to follow a definite tuberculosis of the kidney, but I have known of several cases of myelitis following Pott's disease. In two instances, recovery occurred; an Albee operation was performed in one, and in the other the patient was placed on a Bradford frame. The paralysis was quite complete, but function returned in three months, at which time both patients were able to walk.

Whether myelitis is an infection or a toxic destruction has been discussed widely from an etiologic standpoint. In summing up the results obtained in the removal of a number of cord tumors, and in the exploration of cases of traumatic myelitis, I believe that in cases in which recovery occurs the myelitis is due to

edema, not to cell destruction, and that the myelitis which is permanent and causes crippling of the patient is a true cell destruction. This fact is borne out, as Doctor Rosenow has explained, in cases of anterior poliomyelitis. If the serum is administered during the early stage of the disease, the paralysis is relieved, but if it is administered after the disease has progressed for several days, it is of no value. This proves that if the cells are destroyed, the result is a failure.

Dr. J. H. CUNNINGHAM, Boston, Mass.: Dr. Kretschmer should be congratulated on making a diagnosis of this condition.

Dr. KRETSCHMER: No, I did not.

Dr. CUNNINGHAM: I had the impression that you did on account of the pictures which you have shown. However, the point I want to make is that this condition is more often observed by the general surgeon than by the genito-urinary surgeon and a diagnosis of the condition is rarely made prior to operation. In the four cases which I have operated upon the diagnosis was not made in any of them prior to operation. One of my cases was believed to have a distended gall bladder; one of them was considered a tumor of the kidney, probably malignant; another a stone in the kidney, and the other an ovarian cyst. In three of these patients the cysts were resected, and in the fourth the kidney was removed. In the case in which the kidney was removed it was associated with hypernephroma.

In regard to the treatment of these cases, when the condition is encountered, it seems to me that it should be directed first toward resecting the cyst, and leaving the kidney, which was possible in three of my cases. Some of these cysts, as you know, attain great size, and in those of large size the literature shows that it is far better to drain them rather than to try to resect them; which I have reason to believe true. Very large cysts are often adherent to many of the tissues. It is better practise, I believe, to open such cysts and bring the opening to the surface and allow it to drain. The results from this method of treatment

in these large cysts is by far the best as regards mortality. If the cysts are small and can be resected, this should be the procedure of choice. The literature shows further that a great many kidneys have been sacrificed for small cysts, which I believe should have been resected.

Having presented this subject with a report of my cases before this association in 1916 I think it might be of interest to show at this time what happened to them.

The first case was a female, 58 years of age at the time of operation, in whom a cyst about the size of an orange was removed from the lower pole of the kidney, is still alive.

The second case was a female, 72 years of age, the one with hypernephroma of the kidney, in whom a nephrectomy had been done, died of metastasis four years later.

The third case was a male, sixty-three years of age, with a stone in the kidney, with multiple cysts, which cysts were resected, and he lived nine years, dying of angina pectoris.

The fourth case was a female, twenty-nine years of age, who had a perfectly tremendous cyst originating from the lower pole of the kidney. In this case I resected the cyst which filled the abdominal cavity and required laying bare nearly the whole retroperitoneal space. Following the operation the patient had a fiacal fistula and five years later at my refusal to do anything about closing the sinus she consulted another surgeon who, not knowing the true condition, made the attempt at repair and the patient died of general peritonitis.

President SQUIER: I have been interested in what Dr. Cunningham has said in regard to these cysts being adherent. My experience is rather limited as the condition is rare. I have had however two solitary cysts of the kidney within the past year and in either case it was a simple procedure to slip the kidney out on the loin; it was almost as easy to do in these cases as with a definite mobile kidney.

Dr. WILLIAM F. BRAASCH, Rochester, Minn.: The clinical diagnosis of solitary cysts of the kidney should be made more

frequently than it is. The data of greatest value will be those offered by pyelography and will consist of evidence of displacement or deformity of the renal pelvis. The displacement may be in every direction. If the cyst is in the lower pole, the pelvis will be displaced upward. If the cyst lies lateral to the pelvis there will be displacement toward the spine. The most frequent displacement in our experience has been downward. It must be remembered that considerable displacement of the pelvis may occur as the result of pressure by tumors outside of the kidney pelvis. When the cysts are large enough or are situated adjacent to the renal pelvis they may cause deformity of one or more calices and occasionally effacement of the pelvic outline. Torsion of the renal pelvis will also occasionally result from cyst displacement so that the normal direction of the calices may be completely reversed. I have seen two cases where the cyst communicated with the pelvis of the kidney, causing a peculiar form of hydronephrosis.

Dr. L. E. SCHMIDT, Chicago, Ill.: To give an idea as to the length of time it requires for the formation of solitary cystic kidneys, I will say that fifteen years ago I had occasion to watch a woman with a floating kidney, one you could really throw around in the abdomen and push practically down into the pelvis. She occasionally had Dittl's crisis. She disappeared from observation for a period of about ten years. Five years ago she returned complaining of a large tumor in the abdomen. Cystoscopy, ureteral catheterization and pyelography were carried out, and some of the observations made by Dr. Braasch were noticed. The pelvis did not appear to be involved, and there was no enlargement as far as the pelvis was concerned. A cystic tumor of the kidney was diagnosed. At the time of operation the kidney was found to be rather thickened at both poles and the cyst itself apparently started close to the pelvis, and the entire kidney, both lower and upper poles, appeared as if spread like a funnel. The cystic tumor was rather pear-shaped and spread the kidney substance completely around the tumor. It was impossible to enucleate this tumor on account of the peculiar arrangement of

the kidney completely around the cyst, and nephrectomy was carried out and the patient made a perfectly satisfactory recovery. She was kept under observation for slight attacks of pain before operation, and during the ten years the tumor grew until it reached the size of a fetal head.

Dr. W. C. QUINBY, Boston, Mass.: I would like to ask Dr. Kretschmer as well as any of the members present if they have had any experience with the abdominal injection of air, followed by X-ray; pneumo-roentgenography? If such procedure has any real value, it may show it in such a case as this one just reported.

Dr. KRETSCHMER (closing the discussion): In discussing these cases in the paper I stated that we did not make the diagnosis before operation. That we excluded because of its infrequency.

I was glad to hear what Dr. Cunningham had to say about the subsequent course of his patients. I quite agree with him that resection should be done in these cases, and that is what we started to do in this particular instance, but owing to the fact that profuse bleeding occurred due to injury of vessels it was decided to do a nephrectomy.

Dr. Braasch made some statements relative to making the diagnosis from pyelograms. I looked up the subject in his book in which he has very nice plates of his cystic kidney pyelograms, and the pyelograms as shown in the illustration I passed around do not conform with the pyelograms he obtains. I believe that in some cases, if all these modern methods of diagnosis are carried out, we undoubtedly would recognize a certain number of them. The fact that we had this peculiar type of deformity in this instance was doubtless due to the presence of a calculus.

We have not carried out in these cases the pneumo-peritoneum method of examination that Dr. Quinby asked about. It did not seem to us in this particular instance to be necessary. We thought we had established a diagnosis of a tumor which sprang from the kidney.

The question as to the preoperative diagnosis was answered by the nature of the tumor.

THE RELATION BETWEEN SPINA BIFIDA OCCULTA AND CERTAIN CASES OF RETENTION

A. L. CHUTE

Boston

In the past five years I have encountered a number of patients suffering from a retention of urine that has seemed to depend upon an unusual type of interference with the normal innervation of the bladder. A study of these cases has seemed to point to the probability that this interference depended upon a spina bifida occulta.

I have called attention to this condition in a paper that I read before the Genito-Urinary Section of the American Medical Association in Chicago in June, 1918, and also in a paper that I presented at a meeting of the New York Branch of the American Urological Association in October, 1918. As I believe that this is a commoner condition than many have supposed, and one that deserves more study at the hands of the genito-urinary men, I am bringing it to your attention today. I shall report a few of the most definite cases that I have found though not all, by any means, that I have seen.

The first case of this sort that I recognized came to me in March, 1915—and has been described in my previous papers. She was a single woman, twenty-two years old who had been well up until she had come down with measles two years before. Since her measles she had had frequent and painful urination as well as a turbid and at times foul urine. Three weeks before I saw the patient she had what was apparently a very acute cystitis with bloody urine. Cystoscopy showed an acutely inflamed bladder with evidence of a mild pyelonephritis on both sides. I have no record as to whether or not she had a residual at this time, but two weeks later, after she had had her bladder at rest with a retention catheter, she had an eight ounce residual which gradually increased until three or four months later her bladder had a seventeen to eighteen ounce residual. A Wassermann was negative.

Two careful examinations made by a competent neurologist at intervals of some weeks failed to demonstrate any nerve lesion and the diagnosis of hysteria was made. As this patient carried a large residual urine, she was taught to catheterize herself and she got along fairly well. Shortly after this time an autopsy report on a former patient led me to have radiographs made of this patient's lumbar and pelvic regions and these showed an abnormality in the sacrum and coccyx that was quite in keeping with cases of spina bifida occulta as evidenced by such museum specimens of this condition as I could find. When I last heard of this patient some time later, her condition was not greatly changed—she was kept comfortable by regular catheterization. Figure 1. A drawing made from a radiograph shows pretty well the changes in this patient's sacrum and coccyx.

Case II. This case concerns an unmarried woman, thirty-one years old, who had in September, 1916, an attack of "sciatica." A year later another attack of the sciatic pain, accompanied by very obstinate constipation and bladder trouble, lasting a few weeks. In February 1918 she had to strain a great deal to urinate; after a time she began to have incontinence both during the day and at night. It was for this condition that she consulted me: she then said that she ordinarily felt no desire to urinate but did so at stated times because she knew that she ought—the urine was slightly turbid and she had a residual of 3 counces. It was learned later from her family physician that she had had at one time a considerably larger amount of residual, between 8 and 10 ounces. There was a little irregularity in the region of the sacrum. Radiographs showed the veretebral canal was uncovered in the last two segments of the sacrum. This last occurs so often that in the absence of any evident abnormality it would be considered more as an unimportant anatomical variation than as a defect. This patient was examined by Dr. George L. Walton who could find some loss of sensation in the buttocks. He verified the provisional diagnosis of a lesion of the cauda equina, probably due to spina bifida occulta. In his opinion there was a paresis of the detrusor of the bladder and also of the sphincter due to involvement of certain fibers of the cauda.

This patient was referred to Dr. C. A. Porter for his opinion as to the wisdom of attempting some operative procedure; this he believed would be unwise. He called attention to the fact that there was a marked lack of tone to the perineal muscles which allowed one to feel the anterior wall of the sacrum for a much greater distance than usual. He also pointed out the fact that there was more of a defect on the front

of the sacrum than on the back—evidence that her spina bifida occulta was of the more unusual anterior type rather than the commoner posterior type. This patient was advised the regular use of a catheter and when last seen in September, 1919, was much less troubled with incontinence than she had been. She had at that time, however, a residual of 8 ounces of turbid urine. The radiographs of this patient are not typical. The open sacral canal is seen frequently when no lesion of the cauda is present. The change felt on the anterior surface of the sacrum is not evident in the radiograph.

Case III. The following case is one that came under the care of Dr. C. A. Porter and he has kindly allowed me to make use of it. This man, thirty-five years old, appeared at the Massachusetts General Hospital in March, 1916. His story was that he complained of bladder trouble which had slowly and steadily been getting worse for a period of fourteen years. For three years he had been unable to control urination and defecation. The lack of control of the bowel was only partial; he was unable to control loose movements. When sneezing or coughing there was an involuntary escape of urine and his bladder muscle had no expulsive power; he depended entirely upon his abdominal muscles to empty his bladder. There was an area of anaesthesia in the sacral region supplied by the fourth and fifth sacral nerves, and also anaesthesia on the right in the region supplied by the third sacral. The right side of the scrotum was anaesthetic. By rectum one could feel on the anterior surface of the sacrum two rounded masses with a sulcus between them. They suggested to a certain extent a prostate which was projecting from the back rather than from the anterior surface of the rectum. The mucous membrane moved freely over them. These masses which were about the size of limes, did not fluctuate and evidently arose from the anterior wall of the sacrum. They were not tender but were somewhat elastic. The examining finger could reach above them. The urine was negative. Both sphincters were somewhat relaxed. There was no history of syphilis. A Wassermann of the blood was weakly positive; the spinal fluid was negative; a gold chloride test was negative; X-rays showed what was considered as probably a tumor or cyst involving the sacrum from the second to the fourth segments. This patient was kept under observation for something over a year and was given X-ray treatments on the possibility that his trouble was a very benign type of sarcoma. According to Dr. Porter there has been no improvement in this man's symptoms and no great progression. From the radiographs, of which

I have had a drawing, one may fairly assume that this case belongs to the same type of deformities as those previously reported. The bony deformity is greater in degree than in any of the other cases.

Case IV. The last case is one that has not been reported previously; it is that of a single woman twenty-seven years old, who entered my service at St. Elizabeth's Hospital in June, 1919. Her story was that she had had trouble voiding urine ever since she could remember. Three years ago she had an attack of cystitis since which time she has had pain on voiding gradually getting worse. She has been in various hospitals and while local treatment has always made her better the trouble has always returned when she gave up treatment. Examination showed a thin woman, reflexes normal with the exception of some diminished sensation about the general region of the anus. Her urine was turbid and foul, almost to the extent of having a fecal odor. Various observations showed a residual that varied from 5 to 7 ounces. There was a slight tuft of hair in the sacral region: this is almost pathognomonic of spina bifida occulta. On either side of this tuft of hair there was a little white scar. A certain amount of deformity of the sacrum could be felt externally and likewise there was some change in the anterior surface of the sacrum as felt through the rectum. The patient was given bladder washings and then allowed to go home. She was to report later for operation but has not done so. The X-ray showed a condition that I believe is without doubt a spina bifida occulta. A drawing made from the X-ray gives a fair idea of the bony deformity.

I could add further cases to the list but the reported ones are as typical as any I have had and I believe illustrate the condition well.

It may be contended that the condition seen in these cases is more like a cyst of the sacrum and coccyx than like a spina bifida occulta. In the last case this certainly cannot be so. The tuft of hair, and the scar coincide exactly with the typical spina bifida occulta as described by Virchow. The other three cases with the exception of the tuft of hair, present pretty much the same appearance as this case, both as regards the X-ray and as regards the symptoms. It seems to me that we have reasonable evidence to assume that the condition in these cases is spina bifida occulta and not a cyst of the sacrum.

Spina bifida occulta was recognized by Virchow in 1875 and described minutely by von Rechlinghausen and Fischer in 1886,

and also by Ribbert at a somewhat later date. Attention was called to most of the earlier cases by the presence of a tuft of hair over the region of the sacrum, a condition to which Virchow called attention. It is said that the presence of this mass of hair always means a spina bifida occulta, but on the other hand it is by no means present in all cases. Some cases have shown a diffuse lipoma over the sacrum, others a naevus or a bit of pigmented skin. Still others have shown a fine white scar or perhaps a deep coccygeal fossa. In some instances one finds none of these signs but simply feels a little depression in the sacrum. Radiography has shown a distinct sacral defect in many of the cases recently described, but a large number of the cases reported in the literature antedate radiography.

A word of caution is needed lest one puts too much importance on defects in the laminae of the lower part of the sacrum. One finds that imperfect roofing over of the sacral canal in its lower segments, the fourth and fifth more especially, is common. One finds this low median defect not infrequently in persons who have no evidence of spina bifida occulta. These low sacral variations, if one may call them such, become suggestive of spina bifida occulta only when they are associated with evidence of defective innervation in the region supplied by the sacral nerves. These defects may be indicated by motor, sensory, or tropic disturbances.

Some have held that spina bifida occulta represents the scarring and contraction that follows the intra-uterine rupture of a spina bifida cystica; others that it is simply a lesser degree of the same defect without hernia of the cord or its covering. The bony defect is due to failure of the tissues of the mesoblast which forms the bony and muscular coverings of the cord to push in between the epiblastic tissues that form the spinal cord itself, and that part of the epiblast which forms the skin. This closure of the vertebral canal begins above and ends below. Defects that involve the sacral nerves, those that have to do with interference with the function of the bladder are more common than defects higher up. They are also less often associated with severe motor and trophic disturbances, and it is probable that they are somewhat more susceptible of help. It is likely that

the failure of the bone to fuse depends in part at least upon an increased intra-spinal pressure due to some intra-cranial inflammation. This may account for those relatively rare cases where the spina bifida is anterior and would seem to depend upon direct pressure from within rather than upon any developmental failure.

The symptoms presented by ordinary cases of spina bifida *cystica* have varied considerably but have usually shown marked sensory and motor disturbances of the lower extremity. Club-foot, ulcers of the foot, and similar trophic disturbances have been common. Urinary disturbances have not been as common as these other manifestations and when they have been reported have usually been instances of incontinence rather then of retention. Some of these cases of incontinence however may well have been the incontinence of an overdistended bladder. Some of the cases that have shown incontinence of urine have also shown a lack of complete control of the rectum. As compared with the cases of spina bifida cystica, the cases of spina bifida occulta seem on the whole to be accompanied by rather lesser nerve lesion; the sensory, motor and trophic disturbances of the lower extremities have been less common than in the cases of spina bifida cystica and the urinary lesion has been retention rather than incontinence.

These cases that show retention, seem to represent in a way a lesser lesion than those with incontinence. This is borne out in case II in whom the retention came first and then as the disease progressed was followed by incontinence. I believe in this patient there was at first a paresis of the detrusor with consequent retention and then at a later time there occurred a paresis of the sphincter with consequent incontinence. Since the incontinence was not complete, it would suggest the partial paralysis of both the detrusor and the sphincter. The fact that this patient rarely feels any desire to urinate but simply tried to void at stated intervals because she knows she should, would seem perhaps to speak for some interference with the sensation of the bladder. With this patient there were no reflex changes to be obtained on examination, only indications of nerve changes

consisted in abnormal sensation over the region of the buttocks. In most of my cases that have been examined by neurologists the motor and sensory changes have varied so little from the normal that the neurologists have doubted the existence of any lesion of the cauda. This I take to mean that in these cases, I refer especially to the ones with retention, the nerve changes are so definitely confined to the fibers that supply the bladder that no other abnormal sensory or reflex changes are present.

In many cases of spina bifida occulta the symptoms pertaining to the bladder have appeared early in life as in case IV. In other cases they have appeared late, as in the other three cases I have described. It may seem rather unusual that a condition that was present at birth should not show symptoms early in life. This probably depends on several factors: one is that the spinal cord extends much lower in the vertebral canal in intra-uterine life than it does later:—in adult life the cord ends, and the cauda begins, about the level of the second lumbar vertebra. If any of the fibers of the cauda are attached to the scar tissue filling-in the bony defect in the vertebral canal, there may be no interference with their function until there has been a considerable tension on these fibers; this tension is due to the increasing disproportion in length between the cord and the vertebral canal which takes place in adult life. The mass of fatty, fibrous tissue that fills the bony defect in some instances of spina bifida occulta apparently increased in size as time goes on until it exerts an injurious pressure on the cauda. Then too, this late involvement of the spinal nerves may be more apparent than real. In cases showing retention, this retention and consequently the nerve lesion that caused it may have existed for a very long time before it gave sufficient symptoms to attract attention. Such cases of this sort, as I have seen, have only been recognized after the bladder has become infected and I believe that in these cases, as is the case for instance in cases of diverticulum of the bladder, the condition may go on for a very long time without symptoms unless the bladder becomes infected. It may very likely be, that the interference with the bladder innervation and therefore, bladder function, may have antedated the appearance of symptoms by a very long time.

The mechanism of the retention in these cases is probably an interference with the nerve supply of the detrusor due to a pulling or to a pressure upon fibers of the cauda which results in a partial paralysis of the muscle. Because of the way it is brought about, its intensity and the disturbance it causes may vary markedly. It is possible that some interference with the function of the sensory nerves of the bladder may play a part as in the second case I reported where there was an absence of any feeling or desire to empty the bladder. I should not suppose that any lack of coördination entered into the mechanism of this type of retention.

As the cause of the retention in these patients is probably due to a mechanical interference with fibers of the cauda, it is useless to look for permanent relief by any means other than attacking the problem mechanically at the point where the interference has taken place. Operations carried out for the relief of symptoms caused by spina bifida occulta in general have consisted either in dissecting out the fatty, fibrous mass pressing on the cord or cauda or in separating the nerve fibers that are attached to the scar that fills the bony defect in the vertebral canal. Usually this is followed by a plastic to close the defect in the bony canal. These operations have not been as a whole very satisfactory, but they have occasionally given remarkable results. They seem to be attended with neither the mortality nor the discouraging results that have attended most operations upon cases of ordinary spina bifida cystica. It would seem probable that the earlier these operations were carried out, the more hopeful the outlook for the restoration of the bladder function. In some of the cases of long duration a pressure myelitis has developed. This is probably a very late result. Of course no improvement following operation could be expected if this change had taken place. Of the cases reported in this paper none have been operated upon; one previously reported had what seemed to me to be an inadequate operation, that gave no relief.

I believe that this condition of spina bifida occulta will be found to explain certain very perplexing and trying bladder conditions, and I trust further that a more accurate knowledge will show the way to successfully treat the condition.

DISCUSSION

Dr. Francis R. Hagner, Washington, D. C.: I desire to congratulate Dr. Chute on his valuable contribution. We have to be on the lookout for this condition more frequently than we were before.

I would like to speak of a case of spina bifida that I have had under my observation for some time. The patient was a man who was operated on when a child and had a scar next to the last lumbar vertebra. Dr. Chute did not speak of the cystoscopic findings in his case. This man had the typical paretic bladder which we find in disease of the lower cord. He had retention. We could cystoscope the whole posterior urethra; he had eight ounces of residual urine and nocturnal incontinence.

In tabes and in diseases of the cord there is little we can do. We know what the neurologists have done in the matter of reëducation in tabes in teaching patients to walk who cannot walk. They do not regenerate any of the muscles that have been destroyed, but you can make the other muscles take on action. We have been working now for about two years in similarly educating the patients in those cases that can urinate at all, these cases have unquestionably improved, by forcibly starting and stopping the stream, this of course was suggested in incontinence by the late Dr. Sam Alexander, a former member of this society.

Dr. H. L. Kretschmer, Chicago, Ill.: Since I discussed Dr. Chute's paper in Chicago two or three years ago I have had occasion to see two more cases of spina bifida. Both patients were operated on without any relief of the bladder distress. In both the diagnosis was verified by the X-ray findings. Our roentgenologist called attention to the fact that Dr. Chute mentioned in his paper of not misinterpreting certain superficial defects and to carefully differentiate these from a true spina

bifida. One of the patients was a young man of eighteen who had a residuum of 600 cc., and his bladder was infected. Cystoscopically he had a typical picture of a cord bladder, and in addition to that the ureteral orifices were wide open and gaping. This boy in addition had a club-foot, an associated condition often seen in so many of these cases, as well as the presence of scars from repeated trophic ulcers.

The other patient was a little boy of eight. In this instance, the trabeculations were very scant, so that it would appear that the trabeculations we see in tabetics and others who have spina bifida are slow in their development. The boy scarcely had any trabeculations, and his ureteral orifices were normal. There was no trouble in cystoscoping him. He had no pain, doubtless due to urethral anesthesia. These patients may have sensory disturbances and urethral anesthesia, associated with these defects.

Dr. H. G. BUGBEE, New York, N. Y.: I heard Dr. Chute read his paper in Chicago, and while listening to it two cases came to my mind, both of the patients suffering from retention of urine for in whom I was not able to find a definite cause. Upon returning home I looked up these cases, went over them more carefully, had more X-rays taken, and we found one patient had spina bifida occulta, and the other had a lateral displacement of the last lumbar vertebra with pressure upon the cord.

Not long after I saw a case of retention with Dr. Kerley, of New York. This girl, five years of age, had a typical picture of cord bladder, so-called, and the X-ray showed spina bifida occulta. Within a few weeks he sent me another patient, about eleven years of age, who had suffered from incontinence from the time of birth, thought to be due to bad habits; the child had been repeatedly punished, and all methods were taken to correct his habits. X-ray showed spina bifida occulta.

Since that time I have seen five more cases; it is a condition that must be borne in mind as a possible explanation where we have a cord bladder and are able to eliminate all other causes of this nerve lesion.

Dr. JOHN R. CAULK, St. Louis, Mo.: I enjoyed listening to Dr. Chute's paper very much. I have seen with Dr. Sachs in St. Louis a number of such cases and they all have the typical so-called cord bladder. They all have had retention the same as any other patient with a cord lesion. I wish to report the findings I observed the other day during sacral anesthesia. I cystoscoped the patient previously trying to catheterize the ureters; he had an irritable bladder from tuberculosis, and I was unsuccessful. So I gave him sacral anesthesia. He got complete relaxation of his vesical neck, and I could cystoscope the whole posterior urethra. He presented the same sort of picture that we see with lower cord lesion.

In 500 cases we studied last year, 48 per cent consulted the urological clinic first, and some of our neurological friends did not believe we had a definite picture. When we do have a definite picture, it is as definite as it can be. It is not only the cystoscopic picture that gives a complete diagnosis, but along with this cystoscopic picture there is a loss of sexual power and a paralysis of the rectal sphincter and the tripod is significant of cord lesion. We have had 7 cases not corroborated neurologically which later proved to be cord lesions.

I agree with Dr. Hagner that a great deal can be done for these patients with paralytic bladder by training, by systematic drainage, keeping the bladder empty to relieve overdistention of the fibers that are not disturbed, causing compensatory hypertrophy to take care of the residuum. We have been delighted to observe so many of these men empty their bladders fairly well.

Dr. G. W. WARREN, New York, N. Y.: I have followed a case of spina bifida for the past three years. The patient a boy of fourteen presented himself at the clinic of St. Mark's Hospital, with the diagnosis of a bladder tumor. Examination showed that the bladder walls were markedly thickened. The bladder contained about 10 ounces of residual urine. The cystoscopic examination showed marked trabeculations.

From these findings it seems to me that there is at no time a progressive involvement of the tracts of Goll and Budock. One would expect after a period of time (three years in this case) to find an atrophy rather than a hypertrophy, if one was dealing with a true cord lesion. Patient died from a double kidney infection.

Dr. WILLIAM F. BRAASCH, Rochester, Minn.: I would like to add a word to the value of treatment of the bladders in patients with spinal bifida or tabes. It has been our experience that many patients with deficient vesical control as a result of central nervous lesion could be improved by consistent repeated efforts to develop the lost control. This was aided also by daily catheterization and bladder lavage. A surprising degree of improvement was frequently noted and in cases with much residual urine, there was eventually little or no residuum. In some cases with a slight degree of incontinence, this was corrected.

Dr. BRANSFORD LEWIS, St. Louis, Mo.: I think one other thing can be done to assist in restoring coördination between the detrusor effect and the sphincteric effect. In cases of spina bifida, as well as in the tabetic bladder, I have found it of advantage to use a dilator to weaken the strength of the sphincter, so to speak, to restore balance between weakened detrusors and enable them to be more effective in the expulsive power. In other words, if you have a weakened detrusor and a strong sphincter, that leads to retention and greater disability. If we weaken the retentive capacity by using a Kohlmann dilator, we equalize things and help in that way to restore the urinary equilibrium. That is of distinct advantage in these bladders.

Dr. CHUTE (closing the discussion): I have very little to say in closing. I wish to thank the gentlemen for the discussions and the cases they have reported. Three out of four of the cases I reported showed a marked cystitis, with more or less trabeculation, a fairly typical picture of a spinal cord bladder. These cases of spina bifida occulta show a great variation in intensity

of the symptoms, like any other condition that depends upon insufficient rather than absolutely deficient muscular action. If you catheterize these patients regularly, you give their bladders some chance to rest and do the best that is possible with their deficient bladder muscle power. If they rest up after getting over-tired, the bladder will do its work better.

As to whether the urethra is hyperesthetic or anesthetic, my impression is that there is a lack of sensation, but it is only an impression. It seems to me, it is possible, if we study these cases carefully, we may find that it will be possible to help some of them by operation: many of these patients are miserable enough to warrant considerable risk if there is a reasonable prospect of marked improvement.

Dr. HAGNER: In the case I spoke of there was no great hyperesthesia of the urethra. After catheterization I put him to bed for two or three days.

Dr. CHUTE: I am sure there was no marked hyperesthesia of the urethra in any of these cases.

TUMORS PRIMARY IN THE URETER

WM. C. QUINBY

Boston

Neoplasms arising in the ureter are not at all frequent. In their review of 1903, Albarran and Imbert were able to collect only thirteen such cases, and since this date, there have appeared in the literature only about the same number.

Such tumors are either ectodermal or mesodermal in origin, the former variety predominating markedly in number. Jeanbrau, writing in the Encyclopedie Française d'Urologie[1] in 1914, reports thirty instances of such tumors. He found that in the epithelial group there were seven papillomata, two papillary adenomata, three papillary epitheliomata, and fourteen non-papillary epitheliomata. In the group of mesodermal tumors there were but four cases. Of these, three were one form or another of sarcoma, while the fourth was a fibro-lipoma.

The following case is therefore of considerable interest:

The patient was a single woman of forty, a school teacher, who entered the Peter Bent Brigham Hospital on November 24, 1919. Throughout her life she had had no illness of consequence. She dated her present illness from November 7, 1919, when, after a slightly unusual exertion she noticed a dull aching pain in the left side. This pain had been somewhat intermittent since, and had never been severe. There had been no nausea, no vomiting, and no fever. There had been no association of this pain with the bladder, and the urine as far as the patient knows, was entirely normal.

Physical examination showed a very healthy appearing, middle-aged woman with no abnormality except that in the left side of the abdomen, below and outside the umbilicus, there was found a smooth, oval, firm mass, not moving with respiration, not tender, but which

[1] Encyclopedie Française d'Urologie, Vol. III, 1914, pp. 917–926.

could be pushed about the abdominal cavity for a short distance with ease. Gastro-intestinal studies by x-ray, after the ingestion of barium, gave no abnormal findings. The examination of the urine and of the blood were both normal.

FIG. 1. URETEROGRAM SHOWING CATHETER ARRESTED AT ABOUT CREST OF ILIUM AND IMPERFECTLY FILLED URETER AND KIDNEY PELVIS ABOVE AREA OF OBSTRUCTION

On cystoscopic examination the bladder was normal and there was apparently a normal efflux of urine from each ureter. On the right side the ureteral catheter passed for the usual distance without obstruc-

tion. On the left side, however, the catheter stopped at 14 cm. and from this side the flow of urine was very slow. Pyelogram, after injection, showed the left kidney in its normal position, and below this a definite distortion and obstruction in the ureter which was curved upward, slightly dilated, and the shadow ended in an abrupt tip. This point lay opposite the iliac crest. The kidney was slightly enlarged and the ureter was somewhat dilated above the obstruction. There was no evidence whatever of infection in the urinary tract.

From the appearance of the x-ray plate it would seem that only two conditions could cause the findings: first, an involvement of the ureter by some extra-ureteral infection such as a broken down retro-peritoneal gland; or, second, more probably, definite involvement of the ureter by neoplasm. Palpation of the mass in the flank showed it to be entirely distinct from the kidney.

Under a pre-operative diagnosis of neoplasm involving the left ureter, operation was undertaken on December 10, 1919, by the resident surgeon, Dr. E. C. Cutler. The peritoneal cavity was entered through the left rectus muscle, the intestines being retracted toward the middle line. A definite tumor mass was at once exposed lying beneath the peritoneum just to the left and below the bifurcation of the aorta into the common iliac arteries. Immediately over the upper pole of this small tumor mass, which was as large as a baby's fist, and quite firmly attached, ran the mesentery of the large bowel containing the inferior mesenteric artery, and immediately to the right of the mass, overlying a portion of it, lay the iliac vein. The tumor was intimately adherent with the peritoneum. Immediately overlying its anterior surface, and in the peritoneum itself, was an elaborate meshwork of fine vessels. Search on either side did not reveal the ureter, and it was decided to attempt enucleation, searching for the ureter as the definition of the tumor mass progressed. The peritoneum was therefore incised in an elliptical fashion at either border of the tumor, all the fine vessels being clamped and tied off. Having thus freed it from the peritoneum by blunt dissection it was possible to free the mass from the surrounding structures, especially posteriorly, where it was very definitely adherent, although apparently it lay within a definite capsule of its own. This fixity seemed to be due to the fact that it lay in the very center of a multitude of fine nerves, quite as though it lay in the center of a plexus of a sympathetic system. It was necessary to divide innumerable small fibers during the progress of the operation. Without, however, breaking into the tumor we were able

finally to free it definitely on both sides and beneath without any very large vessel having to be cut. At this stage the ureter was encountered at both lower and upper ends of the tumor mass, through which this structure passed. It was now attempted to dissect the ureter free from the tumor mass, but after practically completing this it was seen

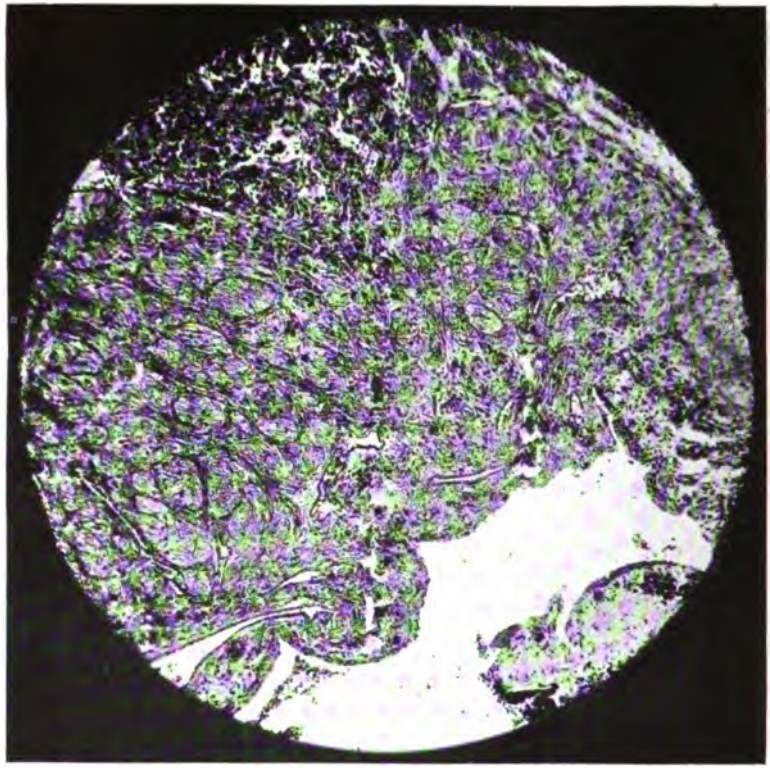

FIG. 2. LUMEN OF URETER SHOWING TUMOR IN UPPER LEFT HAND CORNER, ALSO IN LOWER CENTER. LOW POWER

that the tumor grew into or from the ureter, so that it became evident that this would leave so much of the lesion behind that it was thought most unwise to continue. The ureter was therefore dissected downwards towards the bladder as far as possible and cut across. Dissection was then carried upwards towards the kidney end of the ureter, and when the normal ureter was encountered it was cut across.

Pathological examination of the tumor showing it to be probably malignant and also possibly of renal origin, a nephrectomy was done ten days later. The kidney was found to be entirely normal.

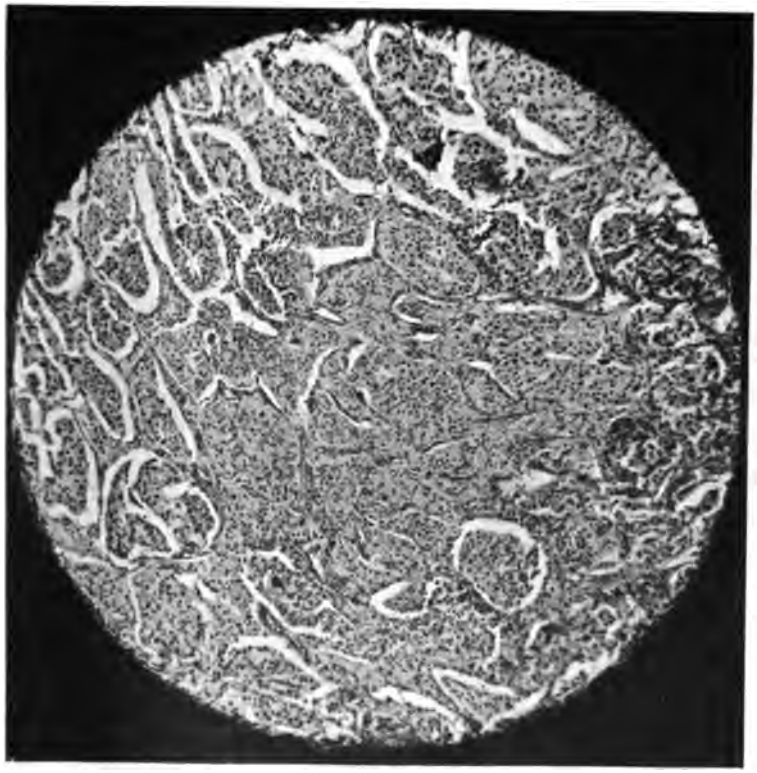

FIG. 3. CENTER OF TUMOR MASS. NOTE NODULAR ARRANGEMENT OF CELLS. LOW POWER

On January 4, 1920, the patient was discharged from the hospital in excellent general condition, and examination made a week ago showed no evidence whatever of recurrence, the patient being in excellent health.

The pathological report of this tumor was made by Dr. S. B. Wolbach, and is as follows:

Gross description. The specimen consists of an ovoid tumor mass weighing 21 grams and measuring 6 by 5 by 1 cm. The outer surface is of cherry red color and shows it to consist of nodules all about 1 cm. in diameter, raised and having a somewhat firmer consistence than the remainder of the tissue. At one pole there is attached to the mass a portion of ureter measuring about 3 cm. in length which runs along the outer surface of the mass, and the lumen of which at one point is completely obliterated by tumor tissue. The consistence of the tumor

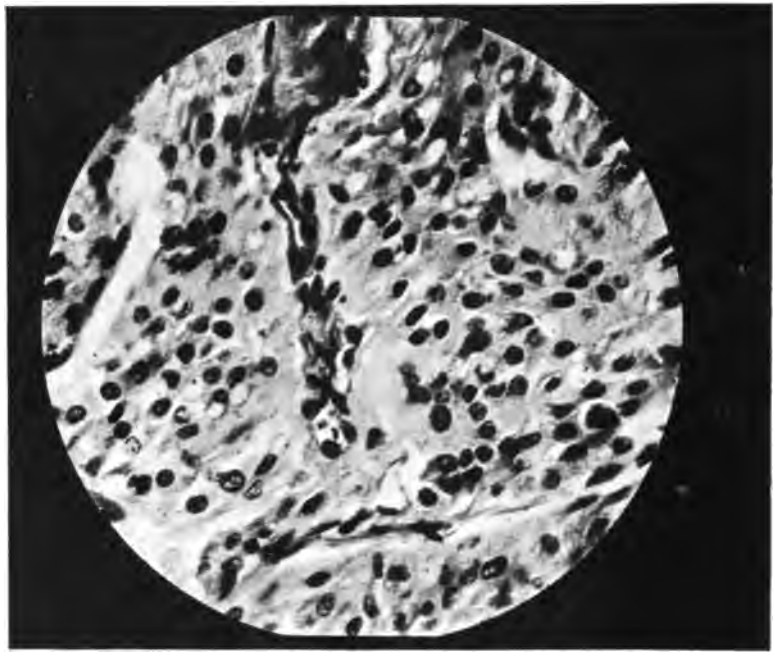

FIG. 4. HIGH POWER SHOWING SEPTUM WITH CAPILLARY LINED BY ENDOTHELIUM

is that of normal liver, but throughout its substance there may be felt firmer, fairly circumscribed nodules.

Cut section shows a surface quite irregularly mottled with various degrees of red color. Toward the surface there are areas quite similar in color and appearance to kidney cortex. Throughout the remainder of the section the color varies from cherry to dark red, considerable hemorrhage apparently having taken place. Encircling the tumor mass is a well defined, pinkish, fibrous appearing capsule measuring

0.5 to 1 mm. in thickness, which at a few points sends off fibrous strands into the substance of the mass.

Microscopic examination. Sections through the main tumor show a fairly uniformly constructed growth composed of columns of cells several deep, separated by a delicate connective tissue stroma which is nearly everywhere penetrated by capillaries. This alone is a striking feature of the tumor, in that the supporting tissue in most places consists of two layers of connective tissue containing an endothelial lined growth. In a few portions of the tumor these spaces are greatly distended with blood. Here and there throughout the tumor are heavier supports composed of connective tissue and smooth muscle bundles. The epithelial cells of the tumor are closely packed. They are irregularly polyhedral in shape except where they have become separated owing to necrosis, and there they assume a round shape. The cells are fairly large, roughly the size of renal epithelium. Even when closely packed together individual cells are often separated by a cuticular-like border. Another feature of the cells is that most of them contain small vacuoles in which may be found, with phosphotungstic acid hematoxylin stain, minute curved rods and granules, the latter often paired. It is probable that these rods and granules are fibrin derivatives. In a few places cells show a tendency to tubular arrangement. The suggestion of a possible renal origin is striking. There are no fibrils or cytoplasmic processes in connection with the tumor cells. The presence of a cuticular border occurs on a few occasions in all parts of the tumor. Mitotic figures are extremely rare.

DISCUSSION

The tumor is unquestionably an invading tumor, but probably one not liable to metastasis. It is definitely an invading tumor and therefore must be considered malignant. Its structure is definitely edematous and of a unique type. It may properly be called a mesothelioma. The pale appearance of the tumor and its location are compatible with renal anlage origin. There is nothing about it to suggest a neuroblastoma or an adrenal tumor.

Diagnosis. Mesothelioma, probably of renal anlage origin.

INFILTRATION ANESTHESIA OF THE INTERNAL VESICAL ORIFICE FOR THE REMOVAL OF MINOR OBSTRUCTIONS: PRESENTATION OF A CAUTERY PUNCH

JOHN R. CAULK

St. Louis, Missouri

It has been estimated that 30 per cent of individuals past middle life have prostatic obstruction, yet only 15 per cent seek relief from symptoms of such obstruction. As the public becomes educated to the understanding that urinary disorders are representative of true physical changes and not habit, and furthermore are not natural consequences of age to which they must become reconciled, I dare say the two percentages will approximate. The effectiveness of such education is becoming manifest. It therefore behooves us as surgeons to produce results with minimum risk in order to maintain the confidence of those who consult.

At present the treatment of the gross adenomatous obstruction is practically standardized, that is, through major surgery by either perineal or suprapubic prostatectomy, only a few cases being suitable for less radical measures, such as high frequency or other endo-vesical procedures. Cancer of the prostate offers many problems. Either radium, prostatectomy or the combination of the two are the methods of election; a very few such cases may be treated by radium in association with minor measures.

There still remains an important group of vesical neck obstructions concerning the treatment of which there is no unanimity of opinion, and which offers a field of further investigation and study. I refer to the contracted neck or so called median bar formation. Randall after analyzing 200 autopsy specimens taken as routine found 14 per cent showing various degrees of contracture of the vesical neck or bar formation, a large percentage occurring between the second and fifth decade. Most

of these individuals showed gross changes of obstruction in the bladder and upper urinary tract, although but few had received treatment or had consulted for symptoms of obstruction. Lowsley's analysis of 224 anatomical specimens showed 14.7 per cent due to enlargement of Albarran's glands. The largest percentage of these occurred in the fourth decade. In analyzing 485 clinical cases of prostatic obstruction which have come under my own

FIG. 1. AUTOPSY SPECIMEN SHOWING CONTRACTED VESICAL ORIFICE WITH BAR FORMATION (AFTER RANDALL)

observation, 97 have been of this type. In other words, about 20 per cent of all obstructions come under this category. Therefore its significance must appeal to us.

It is with this group of obstruction that we must particularly concern ourselves as it seems to be the open avenue through which we may hope to induce an improvement in general mortality statistics, provided we may establish simple measures, unattended with the dangers of open surgery and productive

of substantial results. With the present day appreciation of the importance of uremia and its preliminary correction before surgery, the judicious selection of cases and modern improvements in technique, we can scarcely hope for much change in the results or in mortality statistics by these major procedures.

Let us not consume time in a discussion of the gross and histological changes of this type of obstruction, as they have been thoroughly studied by Randall, Lowsley and others, but direct our entire attention to the therapeutic correction of such abnormalities. In 1830 Guthrie called attention to this type of orifice as a potent factor in vesical neck obstruction and twenty years later Mercier revived interest in this chapter of prostatism and suggested a novel treatment for its correction. Another period of somnolescence ensued until Young of Baltimore awakened interest by the presentation before this Association of his instrument known as the punch or median bar excisor for the surgical treatment of this disease. In his hands it has proved a very effective method of curing a large percentage of this type of obstruction. Many others have also used this instrument with excellent results. I, personally, have cures lasting over nine years without the slightest return of previous symptoms. It seems certainly true that enough tissue is removed by this method to effect complete relief from obstruction. This operation, however, has not been as popular as it deserves, the chief deterrent being the fear of hemorrhage and absorption. Young himself reports frequent occurrence of hemorrhage and has devised methods for its control, such as coating a retention catheter with kephalin, and instruments for the evacuation of clots.

In the presence of infection there is at times considerable absorption following this operation. I have seen several marked reactions. On account of these complications to the operation Stevens, Bugbee, Lewis and others have proposed simpler methods such as high frequency cauterization and incising the orifice through an endoscope with small cautery blades. While these procedures may be effective in the correction of a few selected cases, they are not applicable or effective in the majority

of these obstructions, since they do not seem to remove sufficient tissue. Furthermore, the procedures have to be repeated and take rather too much time to be acceptable.

The Chetwood galvano-cautery operation has been quite successful in the treatment of this type of obstruction. It is done as a major procedure to accomplish what can be done by simpler means. There are some who believe that partial prostatectomy should be the method of choice and I understand that there are still others who have suggested complete prostatectomy for the relief of this condition.

We must realize that most of the patients belong to the younger group, many of whom do not have severe symptoms, so that major methods should be shunned if possible. Such patients are usually treated by local methods, high dilatations, massage and instillations which occasionally give relief but are seldom of definite, not to speak of ultimate benefit. I have been quite surprised to find in the examination of many of these individuals with early symptoms who have been on local treatment that they were carrying a residual of 3 to 6 ounces.

Believing emphatically that the Young punch operation was the effective way of handling this type of obstruction in that it removed sufficient tissue, but fearing to offer it in many instances as routine on account of the bleeding, pain, absorption and discomfort which it frequently caused, it occurred to me that if the same amount of tissue could be removed by electric cauterization, these complications and occasional dangers might be avoided and the operation made more generally acceptable. For this reason I have taken the liberty of modifying Dr. Young's instrument by placing an electric cautery attachment to the distal part of the inner sheath. Initially I had no intention of presenting this instrument and had it designed only for my personal use. But it has developed so satisfactorily and the results have been so uniformly good, that I felt it might be worthy of presentation before this Association.

This instrument is of the same design as the Young punch, but there are a few modifications which I will describe. The outer sheath has not a fang on the slot in order to hold it in

position, as with the electric cautery the coagulation by burning maintains the instrument in place. The obturator sheath has at its terminus an iridio-platinum blade instead of a knife blade. This blade is about ¼ inch in width and of substantial thickness. I tried several smaller blades but they proved entirely unsatisfactory in that they were too frail to stand the pressure and the heat was imperfectly distributed. I have performed 20 punch operations with the present blade and it is still firm and in good condition. The blade is insulated from the main sheath of the instrument by mica plates. At the proximal end of the tube, the current enters through a large contact point with screw attachment, one pole connected with the tube itself, the other

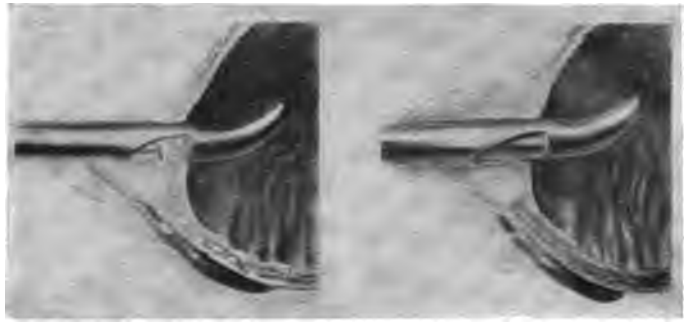

FIG. 2. VIEWS SHOWING YOUNG'S PUNCH IN OPERATION (AFTER YOUNG)

with a large copper bar brazed to the surface of the tube and insulated with silk and mica. The cord which carries the current from the rheostat to the instrument is of large caliber and practically the same size as the copper bar within the tube.

I wish to explain a few of the essential features of the electric part of this instrument. In order to burn tissue properly and prevent hemorrhage the procedure must be done slowly under low heat. Otherwise the process is about the same as with a cold knife. To do this, we must be able to produce enough heat in the blade to burn the tissue without heating the shaft of the instrument. For this reason the conductors have been made large and of uniform caliber throughout so that they offer

the minimum resistance to the current which is thus brought directly to the only point of increased resistance, the cautery blade. In this way an intense heat may be maintained for a sufficient period of time without heating the instrument. The inner sheath serves as a handle for manipulating the instrument. The burning is best done by a slow rotary motion which is easily regulated by using this handle as a lever. I have put no irrigat-

FIG. 3. CAUTERY PUNCH INSTRUMENT WITH SYRINGE FOR INFILTRATING TISSUE OF THE VESICAL ORIFICE WITH NOVOCAIN

ing attachment to the instrument since we do not need dilatation of the orifice and there is much less danger of short circuiting in a dry field.

With the Young punch, the operation can be nicely done under local urethral anesthesia with cocaine or novocain, for it is quickly over and the pain is tolerable. In attempting to remove an obstruction by cautery, however, the procedure must be done

slowly and the ordinary anesthesia is entirely ineffective. For this reason it is essential to have a more profound anesthesia, but since it is our purpose to minimize the risks and hazards of operating, it is most desirable not to subject these patients to general or spinal anesthesia. Sacral anesthesia would be very effective for such operations, but this again falls into the category of major procedures. In observing the obstruction within the grasp of the instrument, it occurred to me that it would be quite simple to infiltrate the tissues of the orifice with novocain through the outer sheath. I accordingly asked Mr. Phillips, an instrument maker, to construct a syringe somewhat on the order of the Geraghty utricle syringe. This syringe has a pistol handle connected with a tube, about a no. 7 French, to the end of which is brazed an iridio-platinum needle. An ordinary Luer syringe is connected with the silver tube at its junction with the handle of the instrument. With this syringe it is perfectly simple under vision to infiltrate the vesical orifice. We have used 1 per cent novocain and one or two 20 mm. syringes usually suffice to produce complete anesthesia.

TECHNIQUE

After washing the urethra and bladder thoroughly and leaving some fluid to be retained, the sheath with its obturator is passed into the bladder, the obturator removed and the fluid evacuated. The orifice is then engaged and the sheath moved around the circumference of the obstruction to be sure it is not trigone, although this is really not necessary. It is usually perfectly simple to discern the orifice with the obstruction engaged in the slot of the instrument. An evacuating tube and cotton pledgets are used to get the field dry. Under reflected light the syringe is passed down the tube and the needle is plunged into the tissue. Considerable pressure is sometimes needed in the very dense obstructions. The needle is gradually pushed through until it comes out on the other side of the obstruction. This is easily appreciated. The instrument is rotated and infiltration is done wherever it is necessary. After a few minutes the cautery blade which has been tested is passed down the sheath, which is held

firmly in the left hand, engaging the obstruction. The current is then applied (with this instrument we use about 150 amperes, which gives the proper heat) and with a rotary motion the obstruction is slowly burned through. When this is completed the current is turned off. The inner tube is removed and the tissue extracted from the blade of the instrument. It is not removed through the inner tube by a forceps as the calibre of the tube is

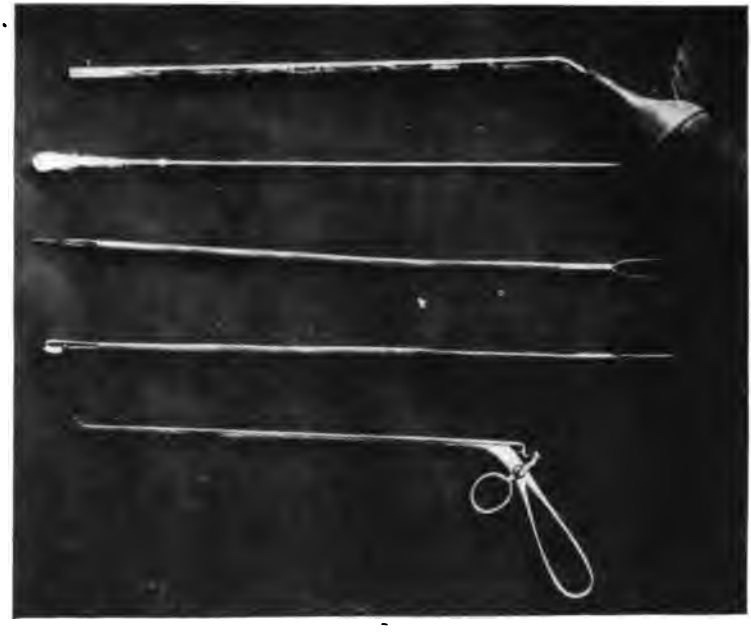

FIG. 4. ASPIRATION SYRINGE, CAUTERY BLADES AND FORCEPS FOR REMOVING OPERATIVE SPECIMENS

encroached upon by the copper bar, and more important is the fact that the tissue is so adherent to the blade through coagulation that it is difficult to detach it. If it is desired to remove pieces on either side of the primary wound, the instrument is rotated to either side and the blade reinserted. I have observed with this instrument which takes a rather large bite, that the midline posterior one is much larger than the others, evidently due to a complete cut through the obstruction allowing lateral retraction

of the tissue. Should there be the slightest bleeding, the obturator tube with blade is reinserted and with very low heat the neck is cauterized. This operation can be done perfectly painlessly, the patient seldom appreciating that it is being executed and they have all remarked that it is less painful than a cystoscopic under local anesthesia.

We have done twenty cases by this method and with the exception of two cases who were suffering with complete retention of urine have not put in a retained catheter. These operations have all been done in the office; most of them have been sent to the hospital for one to three days, several have gone home. We have not encountered a single blood clot and seldom has there

FIG. 5. SHOWING NEEDLE OF INFILTRATION SYRINGE

been more than a stained urine, often only a terminal bleeding about the third day, and this very slight. We have had to give but one hypodermic for pain. To my surprise there has not been any large sloughing. Most of the patients have experienced immediate relief, although some have not received the benefit of the operation until the end of a week. There has not been a single chill or reactionary fever following the operation, and two of the patients had high grade uremia with badly infected urines.

All but two of these cases were done on typical median bars either from sclerosis, gland hypertrophy or cancer. The two exceptions were on individuals with lateral lobes; one of them

I wish to call particular attention to. He had had an incomplete perineal prostatectomy nine years ago and had been obstructed since, carrying a high residual urine with paradoxical incontinence. He was put in the hospital for preparatory treatment in anticipation of prostatectomy, as the obstruction was deemed too large to remove otherwise. After three months his improvement was not sufficient to warrant major surgery and it was decided to try the cautery punch In three sittings I removed fourteen pieces of tissue from the orifice and the patient has obtained an excellent result; he now empties his bladder to within one ounce and his general condition is much improved. The other man had really a small sized median lobe, too big to grasp with the punch He also was a bad risk and had a cord lesion. In order to shrink his lobe I had a cautery needle designed with a point about $\frac{3}{4}$ inch long. With this we pierced the lobe in many places and applied cauterization. This caused sufficient shrinkage to allow the punch to be used. The patient had had complete retention, but today empties his bladder entirely. I believe that lobes which are too large to be engaged can often be successfully dealt with in this way.

One patient had a recurrent carcinomatous contracture of the orifice following suprapubic prostatectomy and has been completely relieved of his obstructive symptoms by means of the cautery punch. We have encountered one case of carcinoma of the median bar in a prostate which otherwise seemed non-malignant. The punch operation has been of great service in post-operative conditions for the removal of contractures and tags. The immediate results of this operation have been most pleasing and gratifying and I see no reason why they should not be as permanent as by the cold cutting, for surely there is sufficient tissue removed to predict a good prognosis.

In analyzing these twenty cases it seems that this operation, owing to its simplicity, its freedom from hemorrhage, absorption and other complications would offer itself as the method of choice for the group of prostatic obstructions due to median bar formations or contractures of the vesical neck, and since it should be attended with a negligible mortality, it commends itself as a means of reducing the gross death rate of prostatic surgery.

DISCUSSION

Dr. J. Bentley Squier, New York, N. Y.: Before calling for discussion on Dr. Caulk's paper, I wish to say that I feel tremendously complimented because in his paper he has put me in a class by myself. The only difficulty is I am not particularly pleased with the class.

For a good many years I have had some more or less definite and some indefinite ideas about how to handle obstructions at the vesical neck. It has not been my belief however, that prostatectomy is a cure for every type of pathologic obstruction at the vesical neck that holds back the urine, and when Dr. Caulk puts his paper in print I shall feel very much better if he revises that sentence.

Dr. Bransford Lewis, St. Louis, Mo.: For a very long time I have been convinced of the pathologic entity of contracture at the vesical neck as distinguished in its effects from the condition of hypertrophy, and have recognized the desirability of meeting the obstruction that came therefrom by means other than that of removing the prostate and have made endeavors toward that end.

I have used the Chetwood method with success in these cases, and I was interested in the endeavor of Dr. Bugbee at relieving this condition of contracture at the vesical neck by means of the high frequency current. I believe he used a small wire, which was not effective. Then I had an irido-platinum blade made with which cauterization was accomplished to a certain degree by means of the high frequency current, using the D'arsonval bipolar current, and getting 8 deeper effect with that. That in certain cases was satisfactory, and I know of certain cases that have been relieved apparently for two or three years, with no residual urine after having had complete retention. I also recognized the shortcomings of that method; it was not sufficiently

energetic to be satisfactory in some cases. I have always been convinced of the efficiency of Dr. Young's punch operation, but never could be reconciled to the danger that comes with it from hemorrhage. I was therefore in a receptive mood, and when I heard of Dr. Caulk's ingenious device for cutting a plug out by means of the cautery method without the accompanying danger of hemorrhage, I took advantage of it in having the same instrument maker (Mr. Phillips, of St. Louis) construct for me one of these instruments with a little modification which I think theoretically might be useful sometimes. In the application of two small air-cocks we can inject either air or water into the bladder and more certainly apply the notch to the desired location.

I have had the opportunity of using this in one case, and with certain definite impressions that confirm the presentation of Dr. Caulk, in a patient who had a certain amount of irritation and four ounces of residuum, and infection was present. Cystoscopic examination showed a little lobule just at the posterior portion of the vesical neck. I have used so much local anesthesia by means of my depositor that I did not take advantage of Dr. Caulk's method of infiltration, but used a preliminary hypodermic injection of H. M. C. tablet about an hour before, and two tablets of cocain, (one and one-eighth grains), applied directly on the neck. The cautery certainly does take the punch out and exactly where you want it. The patient said afterward he did not know when that operation had been done. There was no hemorrhage, either at the time or afterward; I watched closely for it. There was only tingeing of the urine. There was no reaction, no chill or fever, and no complaint from any standpoint. The relief of the residuum of three or four ounces of urine was complete.

That was only done about a month ago, and I am not prepared to say about the permanency of the result, but I am only mentioning the immediate effects. We hope that it will continue to be as efficient as it seems to be now.

I congratulate Dr. Caulk on what seems to be a definite step in advance in removing efficiently tissue there without any of the accompaniments, such as hemorrhage, reaction, and so on.

Dr. CAULK (closing the discussion): In answer to Dr. Geraghty's question, I did not say the obstructions we had removed were of Albarran's glands. I said Lowsley had shown 14 per cent of these obstructions from anatomic specimens were of this type. These were definite contractures of either glandular tissue or scar or both. Two of them were associated with just the slightest notch above, with a slight bar but almost all of these have been definite, slight bar formations and contractures in younger men; but these young men have noticed their piston stroke was not the same as usual. They wet their breeches at the end of urination. Most of the fellows had residual urine which amounted to as much as 6 ounces. They have had just a knuckle at the neck. The only case of definite lobule from Albarran's glands was one of quite good size, and I speared it because the man could not stand anything else. I tried it on the other men. I was not proposing this for the treatment of definite lateral hypertrophy, but for lobules and people who are too ill to attempt anything more radical. This sometimes offers a satisfactory method of effecting a cure.

With reference to anesthesia, I do not know of course, but I believe with Dr. Lewis this hypodermic injection has a great deal to do with it, and we got a definite anesthesia with sufficient intraurethral applications. I have tried it in almost all of them. I take the punch, engage it on this side (indicating), stick a needle in and refill it. I cocainize the urethra beforehand. They feel me touch them with the needle. I apply the blade and if they should squirm, then I would infiltrate that location, giving a little more. Then they wont know your are doing it. Then in turning the punch and touching the place at the line of infiltration, if the patient squirms, you infiltrate here again and he won't feel it. We get better anesthesia if we infiltrate just as we infiltrate tissue anywhere.

We have not had bleeding and absorption. The use of this instrument is simple and I hope you will try it.

Dr. JOHN T. GERAGHTY, Baltimore, Md.: I would like to ask Dr. Caulk if in 20 per cent of the cases in which he found hypertrophy of Albarran's glands, that group was alone involved?

I will admit possibly the Albarran group of glands is involved in a larger per cent, but it has been my experience that seldom do we find hypertrophy of the group of Albarran's glands without also finding hypertrophy in other parts of the prostate. It has been my experience that, except in a very limited number of cases, the punch instrument should be confined to cases of contracture of the vesical orifice. It is certainly not suitable in cases of hypertrophy of the prostate. I think that point should be clearly borne in mind.

Dr. Caulk has had unusual cases and has obtained brilliant results. We should attempt it in selected cases, but it is the inflammatory cases of contracture of the vesical orifice which should be attacked.

The so-called membranous bars are of two types. The one type where you have a slight thickening due to inflammatory infiltration, that does not form a bar. It forms a spasmodic bar which is not a true thickening, or is something you see when you open the bladder. The other is a contracture of the vesical orifice, where you have a median bar that is thickened, that you can see when you open the bladder. You will find this form of hypertrophied tissue, and in that type of median bar the average case is not suited for the punch. In those cases where we have failed to relieve the obstruction, we have mistaken hypertrophy for contracture.

THE RADICAL CURE OF TUBERCULOSIS OF THE SEMINAL TRACT[1]

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I. A BRIEF SURVEY OF THE LITERATURE

In a paper which I presented three years ago ("Presentation of a radical operation for tuberculosis of the seminal tract"), I discussed at some length the operative treatment of genital tuberculosis. I referred to the fact that beginning with the first seminal vesiculectomy by Ullmann in 1889 thirty-two cases were to be found in the literature twelve years later but the results which were obtained by the various techniques employed had been so unsuccessful that I was forced to the conclusion that the radical operation for tuberculosis of seminal vesicles should be abandoned. A further review of the literature showed that the testicle was rarely involved, except late in the disease, and that epididymectomy gave equally radical results as castration. Von Bügner's plan of injecting the vas with iodoformized glycerine was approved but his plan of forcible evulsion of the vas was shown to be bad by published experiences in which both fatal infections and hemorrhages had occurred. I proposed a new method of permanent drainage of the deeper tract, by bringing the upper end of the vas deferens out through the upper end of the wound in the groin where I advised that it be subsequently injected with iodoformized oil or carbolic acid which I also employed (2).

Following this paper, Bellfield added great interest to the question of treating the seminal vesicles and ampullæ by vas-

[1] My thanks are due to Dr. Wm. S. Halsted for cases from his department, to Dr. D. M. Davis and Dr. R. S. Young for assistance, and to Mr. Max Brödel for his splendid drawings.

ostomy in cases of chronic infection and in 1909 Cunningham (6) brought up again the treatment of tuberculosis of the seminal vesicles by means of injection of carbolic acid through the vas deferens, reporting thirty-four cases in which good results were obtained by this procedure. In my recent paper in 1918 (1), I called the attention to the fact, that at my clinic, studies of the cases as years passed by showed that whereas many good surgical results were obtained by removal of the external focus, (epididymectomy or castration) in many other cases very unsuccessful results were obtained, many of the patients dying in great misery from tuberculosis, urogenital or generalized.

I therefore urged the adoption of a radical operation for tuberculosis of the seminal vesicles and presented a simplified method which I had carried out with a special delicate long tractor, which can be introduced through the penile urethra, into the bladder and which greatly facilitates successful removal of the entire tract.

This publication has met with objections from many of my urological friends but believing that the time is now ripe for reopening of the question and a thorough study of the problem both from pathological and clinical standpoint and especially as to the results obtained, I am therefore again bringing before the Association these most important questions—What is the primary seat of infection, its mode of progression to other organs, and the appropriate operation in genital tuberculosis.

Turning to the French literature I find that Guyon (23), the father of modern urology, stated many years ago that the tuberculous process begins generally in the seminal vesicles. He cited 26 autopsys in which the seminal vesicles were primarily the site of disease, in two cases the seminal vesicles were alone involved and in 10 cases the prostate was simultaneously infected with the vesicles. In one case the prostate alone was involved. In 220 clinical observations of patients suffering of urogenital tuberculosis which Guyon examined personally, 40 cases were isolated genital tuberculosis, 74 were cases of tuberculosis of the urinary organs and 108 were combined urinary and genital tuberculosis. In 127 clinical cases in boys before the age of

puberty suffering with urogenital tuberculosis, Guyon found the prostate involved in 56, prostate and seminal vesicles in 11, epididymes 2 times and all of the genital organs 58 times. Guyon asserted his belief that the tuberculous process begins most frequently in the seminal vesicles and that the involvement was from within outward toward the external genitalia.

Guelliot (11) reported that in 59 cases of tuberculosis of the seminal vesicles the lungs were involved in 49, the prostate in 36 and the testicle and epididymis in 34 and the bladder and urethra in 29.

More recently Legueu (2) stated his preference for epididymectomy in unilateral cases, but that in cases where the vesicles were involved and in bilateral epididymal infections the entire seminal tract should be removed. He thought that such operations were not contraindicated by involvement of the bladder or even of the lungs.

At the Thirtieth Congress of the German Surgical Association the subject of tuberculosis of the seminal tract was thoroughly discussed. Bruns reported 111 cases, in 78 of which unilateral castration had been carried out and in 33 double castration. A study of these unilateral castration cases showed the second testicle was involved in 34 per cent in three months, 40 per cent in four months and in 60 per cent in the later cases. He stated that in the 78 cases, in which unilateral castration had been carried out, the other testicle became involved in 26 per cent. As to results obtained by castration, his statistics showed that after unilateral castration only 45 per cent were cured and after bilateral castration only 56 per cent.

Simon stated that in 107 cases, 61 remained cured after castration (57 per cent). Koenig who opposed this operation, thought that in the treatment of tuberculosis of the epididymis and testicle advised "vesiculo-prostatic resection, the best means of access for which consists in osteo-plastic resection of the sacrum, the last piece of the sacrum and coccyx, being included in the flap." He gave no figures.

Bogoljuboff (18) reported 166 cases with tuberculosis of the

epididymis or testicle and states that in 137 cases, the other side became tuberculous within an average time of fourteen months.

Berger (19) gives the following table of 47 cases which were followed over a period of one to twenty-five years.

	NUMBER	NOW APPARENTLY WELL	STATIONARY	DEAD	PER CENT DEAD
1. Not operated	1	0	—	1	100
2. Resection of epididymis	3	3	—	—	0
3. Single castration	34	20	4	10	29
4. Double castration	9	6	—	3	33
Total	47			14	29

Berger claims that 43 of the single or double castration cases, 26 (60.4 per cent) are sound up to the present, but some have been followed only two years or less.

In England, Thompson Walker (3) presented a study of 100 cases of genital tuberculosis, in which the genital organs only were involved in 50 cases, genital and urinary 37, genital or other tuberculosis (lung, etc.) 13. Of the 100 cases, the epididymis was affected in 72, in 16 the prostate and seminal vesicles were also involved, in 14 the seminal vesicles, in 16 the prostate alone, was involved. We have, therefore, 46 cases, out of 72 (64 per cent), in which the region of the prostate and vesicles was involved. He thinks that the infection may reach the epididymis by the blood stream and also by the vasa deferentia. Thompson Walker also states that tuberculosis of the epididymis invariably involves the second epididymis after a year or more. He concludes:

> My practice is to treat chronic tuberculosis with tuberculin and to limit operative procedures to opening and scraping abscesses when they arise. Such treatment must invariably lead to chronic discharging sinuses. If the disease appears to be spreading in spite of the tuberculin treatment, epididymectomy is performed and if it is already very extensive and has involved the testicle, this organ is removed. I have not found it necessary to perform extensive operations for the removal of the pelvic portion of the vas deferens.

In a remarkable article, "The paths of infection in genito-urinary tuberculosis," MacFarlane Walker, in 1913 (23), presented the most careful historical, clinical and experimental study of genital tuberculosis. He states that in a series of 22 cases of tuberculous epididymitis involvement of prostate and vesicles was discovered in 20. Of the two exceptions, one was a baby of fifteen months and the other a boy who had undergone bilateral castration at the age of fourteen. Walker says that "In every one of these cases the first signs of disease detected in the lower pole of the epididymis;" and that at the lower pole, the first signs of softening and breaking down are observed.

That the lower pole of the epididymis should be the commonest site of the primary deposits is only to be expected, if the tuberculous infection is a descending one. It is the first spot to be reached by the infective agent in its journey down the cord. The tuberculous testicle falls into the same category as a gonococcal one, and if we are prepared to admit a descending infection in the case of the gonococcus, we cannot rationally deny it in the case of the bacillus of tubercle.

Walker then details the experiments which he carried out with various bacteria. In one he inoculated the anterior urethra of guinea-pigs with organisms and after twelve hours, abundant growth was obtained from the epididymis and much scantier one from the testis. The same organisms were found in the vesicles and in the plexus of lymphatics, running with the vas. A control cultivation of the blood gave a negative result. Microscopic sections of the tissues in these cases, shows the presence of numerous organisms in the lymphatics, surrounding the vas. In the lumen of the vas, itself, few or no organisms were found.

Baumgartner's failure to produce a descending tuberculosis, experimentally in rabbits is, in my opinion, no proof of any inability on the part of the tubercle bacillus to descend the cord, in a direction contrary to the secretions. The inoculation of the urethra or even of the cord is insufficient; it is necessary also to prepare the testicle for the reception of the tubercle bacillus by previously injuring it.

Walker states he inoculated the rabbit's urethra and exposed the left testicle to a certain amount of trauma. At the end of

six weeks the epididymis was indurated and swollen on the injured side. Autopsy showed tuberculosis of the epididymis and seminal vesicle and microscopic examination showed tuberculosis in the epididymis but absent in the body of the testicle.

The possibility of the lymphatics of the cord acting as the path along which a descending infection of the testicle may advance is supported to some extent by the appearance of specimens obtained from the post-mortem room. The prostatic and the testicular extremities of the cord are markedly affected, whilst the intervening portion appears healthy. If transverse sections be made and examined microscopically the following is found to be the exact distribution of the tuberculous lesions. Transverse sections of the prostatic extremity show that the vas itself is comparatively healthy but that it is surrounded by a thick shell of tuberculous tissue, due to infiltration of the lymphatics. As the testis is approached this lymphatic infiltration gradually ceases. A section of the distal end of the vas, near its termination in the epididymis shows a converse condition. Here the disease has affected the mucosa of the vas, whereas the surrounding lymphatics give a little or no evidence of any lesion. This distribution suggests that the disease is disseminated from the prostate, by the lymphatics, and that having encountered in the epididymis a suitable soil, in which to flourish, it produces a returning wave of infection in the vas, through the agency of the secretions. It is interesting to note that the microscopic examination of the genital tuberculosis experimentally produced in the rabbit by urethral inoculation shows an exactly similar distribution. The prostatic extremity of the vas and the seminal vesicle on the diseased side were enclosed in a dense shell of tuberculous infiltration, the inner coat of the vas being healthy.

Apart, therefore, from other considerations, the distribution of the tuberculous tissues alone suggests the existence in these cases of two opposing waves of infection, a centrifugal and primary one, traveling from the prostate along the lymphatics; a centripetal and secondary one, in the lumen of the vas, due to the flow of infected secretions from the diseased epididymis.

From a consideration of the above, it would appear that infection of the testicle (i.e., epididymis) takes place in tuberculosis, as in gonorrhea, by means of the cord and not by the blood stream. That cases of haematogenous infection occur cannot be denied, but they are few in number. The evidence in favor of the frequent occurrence of a descending genital

tuberculosis may be tabulated as follows: Clinical evidence: 1. It is extremely rare to find tubercle of the epididymis without discovering some indication of diseases of the prostate or the vesicle. 2. Prostatic tubercle is not infrequently found without any lesions of the testicle. 3. The appearance of a tuberculous epididymitis is often preceded by symptoms of prostatitis or vesiculitis, the so-called prodromata of tuberculous epididymitis. 4. The earliest signs of tuberculous disease are found at the lower pole of the epididymis. This is the first position which opposes the line of march of the invading organisms. 5. Tuberculous disease of the testicle is analogous to acute infections which are known to have been produced by extension from the urethra. The ordinary type of tuberculous epididymitis has no analogy to the haematogenous orchitis of mumps.

Pathological evidence: 1. Lesions of the testicle without disease of the prostate are rare, whereas tuberculous lesions of the prostate are not infrequently found unaccompanied by disease of the testicle. 2. When tubercle of the testicle is found in association with tubercle of the prostate, the lesions in the prostate generally have the appearance of being older than the lesions in the epididymis. 3. Tuberculous nodules in the lower pole of the epididymis usually appear older than those in the upper pole. They are the first to soften and break down."

Experimental evidence: 1. Micro-organisms and inanimate granules are rapidly absorbed from the urethra and carried to the testicle. 2. A tuberculous epididymitis may be experimentally obtained by inoculating the urethra after having damaged one of the testicles.

The experiments of MacFarlane Walker are of utmost importance in that they show the futility of hoping to completely eradicate the disease by epididymectomy or castration.

A brief report of some of the most important articles in the American literature, is of interest.

In 1907, E. L. Keyes, Jr. (24) presented a careful study of 100 patients with tuberculosis of the testicle, 53 being bilateral. Speaking of the site of the first infection, he says:

In only 25 cases, was I able to obtain information on this point and yet in 19 of them the nodule appeared in the tail of the epididymis and only 6 in which it began in the head.

In 87 cases Keyes states that the opposite testicle was affected in 53 cases and that 34 had not done so when last seen; in 10 patients, in whom the testicle was involved at the time of operation, 3 relapses on the opposite side occurred within one year; two after one year and two more after two years, making 7 relapses in all, while of the remaining 3 in whom the opposite testicle was not known to be involved, two were followed less than a year and one followed two years.

Further evidence of the futility of attempting amputation of tuberculosis is the involvement of the other organs in two years, in unilateral orchidectomy, one case of urethral abscess, one of vesicular abscess, two of tubercular kidney, one of acute prostatitis, and one of tuberculous inguinal adenitis. Such results simply confirm the belief that, though apparently localized in the testicle or elsewhere in the body, tuberculosis is a disseminated infection, which cannot be amputated.

Keyes draws the following conclusions:

Testicular tuberculosis is never an isolated lesion. Relapses in the opposite testicle occur within a few years in 8 or 9, out of 10 cases. Be the operation ever so slight or ever so radical, relapses upon the opposite side almost inevitably occur.

In a series of important studies on genito-urinary tuberculosis Barney (4) brings forth similar testimony. He states that in 821 cases in which the condition of the prostate and seminal vesicles were described, 75 per cent were tuberculous. In 101 rectal examinations, in Barney's own series of cases of genital tuberculosis, 76 revealed tuberculosis of the prostate and seminal vesicles.

Barney states he has traced 113 patients with tuberculosis of the epididymis from one to twenty-five years after operation and that 27 per cent of them died of some form of tuberculosis.

Eighty-one per cent of those examined and 28.5 per cent of those reached only by letter, are still within the six-year period, and it is to be expected that the deaths from tuberculosis are not yet at an end.

Barney makes the following very strong statement:

I have already pointed out the disastrous results of genital tuberculosis and the rapidity of recurrence. It has been shown that the second epididymis is attacked in 26.5 per cent within the first six months after the involvement of the first side; that the disease invades prostate and vesicles in 30 per cent within the same time; and that testicular tuberculosis within this period is found in 60.6 per cent. If one adds to this misfortune, the annoyance of bladder irritability and the affliction of sterility, the outlook is indeed gloomy. It is also to be remembered that a very large proportion of patients have the proverbial axe hanging over them in the form of tuberculosis of other organs.

In an interesting paper in 1910 Whiteside (5) called the attention to the fearful ravages of testicular tuberculosis and ineffectiveness of resection of the epididymis. He stated that from autopsies and his own clinical experience, that he believed involvement of the entire genital tract to be frequent and that epididymectomy was entirely inadequate. He stated that he had recently practiced a very radical method of operation in such cases and cited the case of a man in a deplorable condition with involvement of both, testicles, epididymes, prostate seminal vesicles and bladder, in which a wonderfully satisfactory result was obtained by extirpation of seminal vesicles as well as the external foci of involvement. Whiteside (17) has recently published another article on this subject, reciting several remarkable results in apparently desperate cases and calling attention to the value of a radical operation. In response to a personal letter of inquiry, he states that he is unable to get exact statistics of number of cases or results but says,

My remote results, quoting from memory, are that those patients who have survived are well. They even tell me that they are sexually able to perform coitus. These with good resistance to the disease have complete healing of all operative wounds and resultant sinuses before six months after operation. Those that are tuberculous elsewhere than in the genital tract have one or more sinuses in the perineum or groins for a year or more. These cases for which I advocate radical removal of everything tuberculous are advanced cases. Consequently a large

percentage of these have, or soon suffer from, further tuberculosis (lungs, kidneys, etc.) and many died within five years after operation.

Cunningham (6) states that in 86 patients showing tubercular epididymitis 49 showed lesions of the prostate or vesicles. Cystoscopy was carried out in 51 of these 86 cases and showed tuberculosis of the bladder in 16, in 9 of which one kidney was tuberculous and in 5 both kidneys involved; 67 had distinct signs in the lungs.

Cunningham says (p. 388):

> Barney's report, the most recent and complete in regard to end results, showing a mortality of 85 per cent within six years following such procedures (epididymectomy and castration) in an institution of the highest surgical efficiency is far from satisfactory.

He then recommends the plan of von Büngner, of injecting the vas after epididymectomy, advising the use of pure carbolic acid and reports 32 cases thus treated, viz.:

To summarize: Of these 32 cases, 7 or 21.7 per cent have died in ten years; 25 or 88.3 per cent are living; 4 have demonstrable tuberculosis in the genito-urinary tract; one has no demonstrable tuberculosis, but the inoculation test is positive; 20 or 62.5 per cent are locally free from the disease.

Following my paper in 1918 (1) there appeared an excellent article by Quinby (7) in which he reported 7 cases, operated upon by technique similar to that described by me, with excellent results.

II. STUDY OF CASES AT THE JOHNS HOPKINS HOSPITAL

A. In order to see what our own statistics show on the various questions which have been brought up in this study of the pathology and surgical treatment of tuberculosis of the seminal tract, I have examined the records of 86 cases of genital tuberculosis in the general surgical department of the Johns Hopkins Hospital. The operations performed on these cases were as follows:

Castration: Right, 24. Of these 4 had left epididymectomy, and 1 had previous right epididymectomy.

Left, 29. Of these 3 had right epididymectomy, and there is no record of previous left epididymectomies.

Both, 5.

Epididymectomy; Right, 10. Of these one had right castration and 3 had left castration subsequently.

Left, 6. Of these 4 had right castration.

Right and left, 5. No note of castration subsequently.

Nephrectomy: 3.

Perineal section: 1.

Suprapubic cystotomy: 1.

No operation: 15.

Remark: I have been unable to secure sufficient replies from these patients to determine the results which have been obtained by the treatment which was given. Most of these patients were operated upon a long time ago, before the operation of epididymectomy had been introduced into this hospital, and as a result castration was more often employed. I have searched the pathological records and found satisfactory pathological reports as follows: Castrations 27; in all of these the testicle, epididymis, vas and part of the cord had been removed. Gross and microscopic examination shows tuberculosis of the epididymis in all of these cases and in 20 cases also tuberculosis of the testicle. In 7 cases the testicle was reported to be uninvolved, although the epididymis was markedly tuberculous. Only 2 of these cases were bilateral.

B. I have next analyzed 66 cases of tuberculosis of epididymis in patients who have presented themselves at my private clinic and which have been carefully studied by Dr. R. S. Young. The totals are as follows:

(*a*) *Involvement according to clinical examination:*
Epididymis: Right 16, left 17, both 23, total 56.
Testis: Right 7, left 4, both 0, total 11.
Vas: Right 2, left 1, both 3, total 6.
Vesicles: Right 6, left 1, both 11, total 18.
Prostate: 14.
Bladder: 24.
Kidney: Right 5, left 11, both 2, total 18.

(*b*) *Operations performed:*
No operation: 10.
Castration: Right 7, left 10, both 0, total 17.
Epididymectomy: Right 10, left 12, both 10, total 32.
Vasectomy: 1.
Suprapubic cystotomy: 0.
Nephrectomy: Right 3, left 8, total 11.
(*c*) *Subsequent operations:*
Castration: total 2.
Epididymectomy: Double 1, single 2, total 3.
Nephrectomy: total 2.
Abscess of groin: total 2.
Suprapubic cystotomy: total 1.
Abscess of perineum: total 1.
(*d*) *Ultimate results (63 cases):*
No information: 18.
Well: 8.
Improved: 14.
Not improved: 2.
Worse: 3.

Length of time followed since operation: Under one year 2; between one and two years 7; two years 4; three years 2; four years 3; five years 1; six years 2; eight years 1; nine years 1; twelve years 1.

Fatal cases: 18 (not included in above dates).

Interval between admission and date of death: In hospital 3, less than one year 6; one year 1; two years 2; three years 1; not stated 3.

Among fatal cases no operation performed in 2 cases.

C. Further analysis of cases (operative):

Region involved:

Right epididymis 16, epididymectomy 10. No subsequent operations.

Left epididymis 17, epididymectomy 12. Of these 1 required right epididymectomy two years later, a second required right nephrectomy for tuberculosis seven years later and developed tuberculosis of left kidney six years later, a third had right nephrectomy for tuberculosis one year previously and a fourth had right castration one year previously.

Both right and left epididymis 23, double epididymectomy 10. Of these 1 required left castration four and one-half months later, a second required castration three years later.

Right kidney 5, nephrectomy 3. No subsequent operations.

Left kidney 11, nephrectomy 8. Of these 1 required left epididymectomy four months later, 2 others required double epididymectomy five and two months later.

D. Cases of bilateral involvement of the epididymes, region involved:

Number of cases 23. Of these cases the second epididymis involved was:

(a) Globus minor of second epididymis involved without any, or very little, involvement of the globus major 9.

(b) Globus major involved in second without any, or very little, involvement of globus minor 1.

(c) Both markedly involved, so that primary site in epididymis could not be told 9.

(d) History not clear in 4.

E. Cases complicated with:

Tuberculosis of kidney 4 in these cases:

Globus minor involved 3.

Globus major involved 0.

Entire epididymis involved 1.

In cases of tuberculosis of epididymis with tuberculosis of seminal vesicles and prostate:

Globus minor involved 12.

Globus major involved 3.

Entire epididymis involved 21.

F. An analysis of the cases of:

One sided epididymal-tuberculosis in which there was no prostatic nor seminal vesicle involvement made out 10:

According to history:

Swelling or pain began at upper end 1.

Swelling or pain began at lower end 2.

Not determined 7.

At examination:

Involvement only of globus minor 4.

Involvement only of globus major 0.

Involvement of entire epididymis 6.

At operation:
Involvement only of globus minor 2.
Involvement only of globus major 0.
Involvement of entire epididymis 4.

G. These statistics show conclusively the absence of isolated testicular tuberculosis and the rarity of testicular involvement when the epididymes are extensively involved. What is the point of primary involvement in the epididymes? Table F seems to show that even without discoverable involvement of vesicles and prostate, the globus minor is more often the point of primary involvement in the epididymis. Table E seems to show very conclusively that when the opposite epididymis becomes involved, it is generally the globus minor which is first involved. This is also true in cases of epididymitis in which the vesicles were made out to be involved on rectal examination. Can we not justly draw the deduction that in almost all cases the primary focus in genital tuberculosis is the seminal vesicle? The prostate is definitely shown to be extremely rarely the primary seat of involvement.

H. In another study of 17 cases of castration, all are found to be tuberculous. No cases were found in which normal testes were removed. In 1 case of double epididymectomy, right castration was performed three years later (elsewhere).

Résumé. Of 63 cases, 53 were operated upon. Of these 18 have already died, 18 have not been heard from and of the 45 cases heard from 13 have been operated upon less than three years and 9 less than two years. There remain, therefore, out of 63 cases only 27 who are known to be or have been alive three years or more since admission. Of these only 22 are known to be well and improved. When we consider also that with the exception of about 24 cases the urinary tract was not involved and that the cases were, therefore, fairly early cases of tuberculosis of the seminal tract, the results obtained by epididymectomy or castration are indeed shown to be very poor. In many of these cases the seminal vesicles were injected through the vas from 1 to 4 times during and after operation, either iodoformized oil or pure carbolic being employed.

I. Analysis of 28 cases of uro-genital tuberculosis without involvement of epididymes or testicles:

Region involved (as made out at examination):
Prostate: 26.
Seminal vesicles: Right 1, left 1, both 14, total 14.
Bladder: 16.
Kidney: Right 2, left 2, both 1, total 5.
Previous operations performed:
Nephrectomy: Right 2, left 1, total 3.
Suprapubic cystotomy: total 1.
No operation on prostate or vesicles in any of these cases.

Results: Only one of these patients is said to be well. He had tuberculosis of the prostate, bladder and both seminal vesicles and no operation was performed, seven years have elapsed since he was here. He has not been examined personally.

Four are said to be improved and have been followed six, seven, eight, and thirteen years respectively.

In all of these 4 the prostate was involved, in 2 the seminal vesicles, and in 2 the bladder. The kidney was involved in 1 case and in the latter case nephrectomy was performed. In the other 3 cases no operation was done.

Repeated questionnaires have been sent out and 5 are known to have died.

. In 18 cases no information can be obtained and it is probable that in many of these the patient has died

Comment: This is another melancholy record resulting from the non-operative treatment of tuberculosis of the seminal vesicles and prostate.

III. ANALYSIS OF STATISTICS TAKEN FROM THE LITERATURE AND OUR OWN SERIES OF CASES

We herewith present in tabulated form certain clinical and pathological statistics taken from the literature to which we have added similar statistics from our own cases, the 63 mentioned before in B.

a. Tuberculosis of epididymis.

	NUMBER OF CASES	PROSTATE OR VESICLES INVOLVED
		per cent
Thompson Walker	72	64
McFarlane Walker	22	91
Barney	100	77
Cunningham	86	57
Young	55	60

Remark. These statistics are sufficient to show the fact that among patients presenting evidence of tuberculosis of the external genitalia more than 50 per cent present definite evidence of involvement of the prostate or vesicles or both. In view of the fact that early lesions in the vesicles are difficult to prove, we feel that the statistics of Barney and possibly of McFarlane Walker are more nearly the correct per cent. Among my cases, 30 are unilateral which is additional confirmatory evidence that the seminal vesicles become involved early in testicular disease, if not preceding it. As a matter of fact, all statistics and particularly those of McFarlane Walker go to indicate that the seminal vesicles are the primary site of disease in a great majority of cases of tuberculosis of the epididymis.

b. Percentage of bilateral involvement of the epididymes or testicles in cases of tuberculosis of the epididymis or testicle.

AUTHOR	CASES	BILATERAL	PERCENTAGE
Keyes	100	53	53
Bruns	111	42	38
Bogoljüboff	166	137	82
Berger	43	9	20
Barney	150	60	40
Koenig			75
Young	78	28	36

These figures simply confirm what has already been stated before, the great frequency of bilateral testicular or epididymal involvement and the frequency of simultaneous involvement of the seminal vesicles.

c. Involvement of the second testicle after operation.

AUTHOR	CASES	OPPOSITE SIDE INVOLVED
		per cent
Bruns	78	26
Keyes	87	53
Barney	106	15

The above table is further proof that after removal of the disease on one side there remains a tuberculosis of the seminal vesicles from which the other testicle becomes involved, another argument showing the inadequacy of unilateral epididymectomy or castration.

d. We have next collected the statistics as regards cures which have been effected by castration or epididymectomy. In most instances it is not possible to determine whether a single or double operation was performed, nor have the epididymectomies been separated from the castrations. There is also considerable variation as to what is considered a cure—a cure of the lesion in the scrotum is quite different from the entire disappearance of the disease from the whole genital tract. In my statistics I have included in this table also cases which were improved. If cures only were included, the percentage would be only 19 per cent.

e. Percentage of cures obtained by castration or epididymectomy.

AUTHOR	NUMBER OF CASES	UNILATERAL CASTRATION OR EPIDIDYMECTOMY	BILATERAL CASTRATION OR EPIDIDYMECTOMY	BILATERALITY NOT SPECIFIED
		per cent	*per cent*	*per cent*
Bruns	111	45	56	
Berger	47	55	66	
Simon	107			57
Barney	113			73
Cunningham	32			62
Young	42			45

The above statistics are proof of the ineffectiveness of castration or epididymectomy. Barney's words are most significant:

Let us now see what encouragement can be held out to the patient with tuberculosis of the epididymis (by epididymectomy). I have traced 113 patients from one to twenty-five years after operation. Over 27 per cent have died of tuberculosis. Within the period of six years after operation 41 per cent of 58 patients have died of this disease. Eighty-one per cent of those examined and 28 per cent of those reached by letter are still within the six-year period in which I have found that 85 per cent of deaths occurred. It is to be expected that tuberculosis in this group is not yet at an end.

f. In order to determine the relationship between cure and the previous presence of tuberculosis of the prostate and vesicles, I have carefully searched the records of our cases of epididymectomy and castration with the following result:

Cases of epididymectomy or castration reported as well or improved

	NUMBER OF CASES	PROSTATE INVOLVED	SEMINAL VESICLES INVOLVED	BOTH INVOLVED	NO INVOLVEMENT
Well	8	1	0	2	5
Improved	14	2	2	4	6
Dead	18			7	3

Dead: Prostate and bladder, 1; vesicles and bladder, 1; vesicles, prostate and bladder, 2; kidney, 1; kidney and vesicles, 1; bladder, 1; bladder and kidney, 1.

Analyzing the above tables we see that in the cases that got well 5 out of the 8 had no evident involvement of vesicles and in those that were recorded as improved there was no involvement in 6 out of 14; showing conclusively that a large percentage of the few good results from epididymectomy or castration are among those early or isolated cases in which the involvement of the prostate and seminal vesicles is either absent or too small to be detected, and the fact that among those patients who are reported dead only 3 out of 18 have no involvement of the deeper structures is also strong evidence that the more radical operation should have been carried out in those cases.

Résumé of argument. The preceding statistics seem, therefore, to show conclusively that in the great majority of cases the primary involvement is in the seminal vesicles (or prostate), from which the epididymes or testicles are subsequently involved,

the external disease being bilateral in 30 to 50 per cent of the cases. In a probably larger percentage of the cases the involvement of the seminal vesicles is bilateral (61 per cent of my cases in series B and probably higher). The disease reaches the epididymis generally by the lymphatics of the cord from the seminal vesicles and first involves generally the globus minor. It is probably erroneous to suppose that primary tuberculosis of the epididymis often occurs. It probably seldom occurs through blood stream infections as so often held. The seminal vesicles are not only the primary focus from which the epididymes are involved, but from which also the prostate, bladder and the kidneys in many cases. In fact, tuberculosis in the region of the prostate and vesicles is far more dangerous to the entire human organism than tuberculosis of the epididymes and is probably responsible for the fearful mortality which is variously estimated at from 27 to 60 per cent in cases of genital tuberculosis. Therefore, it is the duty of the surgeon to attack the most dangerous focus of involvement, namely, that of the vesicles and prostate. Therefore, in tuberculosis of the seminal tract in the great majority of cases radical operation should be not only the operation of choice but practically imperative. A realization of the bad results obtained by epididymectomy or castration led the writer in 1913 to devise the radical operation, which will now be described.

IV. DESCRIPTION OF RADICAL OPERATION FOR EXCISION OF TUBERCULOSIS OF ENTIRE SEMINAL TRACT

The radical operation has been previously described but it is necessary to refer to it again here (fig. 1).

The ordinary inverted U perineal incision (fig. 2) which I have always employed for perineal prostatectomy, has been found entirely satisfactory, and after division of the central tendon and recto-urethralis muscle (figs. 3 and 4), the membranous urethra and apex of the prostate are easily exposed without cutting the levator ani muscles (fig. 5). Up to this point the tractor has been introduced only sufficiently far so

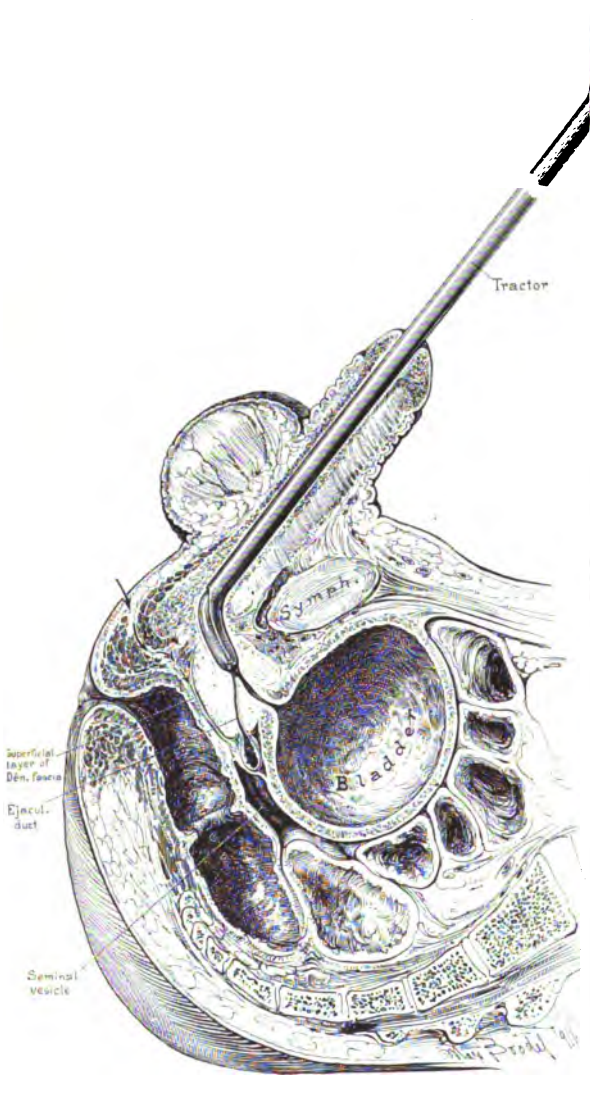

FIG. 1. SHOWING THE ANATOMY, ARROWS INDICATING ROUTE. TRACTOR IN URETHRA

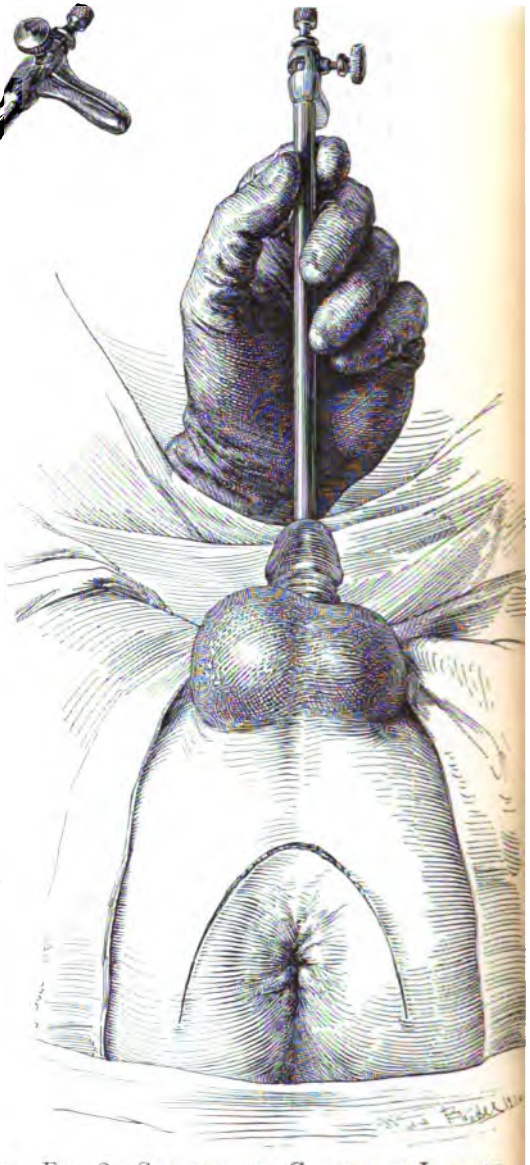

FIG. 2. SHOWING THE CUTANEOUS INCISION. TRACTOR IN URETHRA

that its beak lies in the membranous urethra, thus giving an index of this region. It is then carried into the bladder

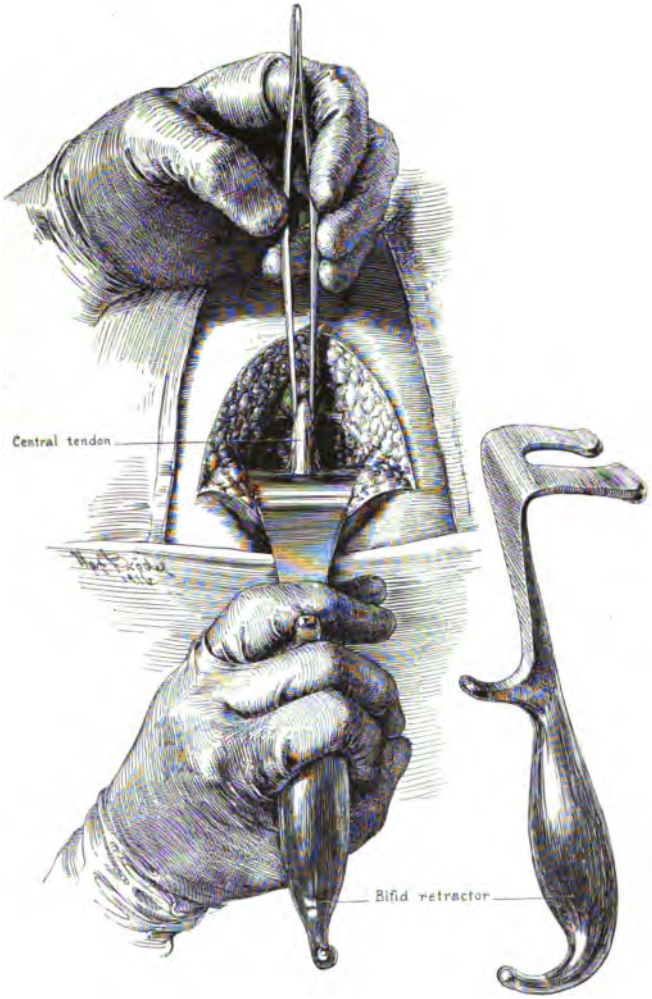

FIG. 3. CENTRAL TENDON PUT ON TENSION BY BIFID RETRACTOR, PREVIOUS TO DIVISION

opened out, traction made and pressure employed (figs. 6 and 7), thus by leverage forcing the prostate and seminal vesicles up into the wound where little difficulty is experienced in uncov-

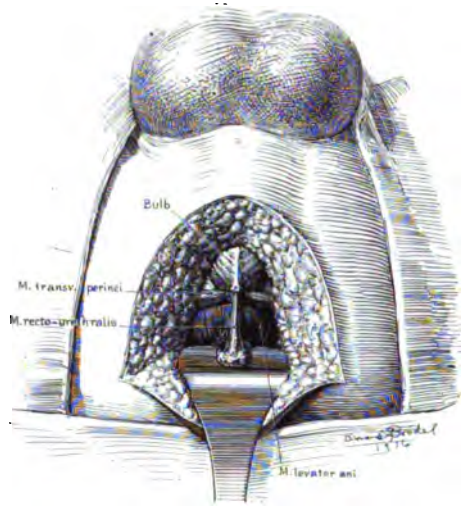

FIG. 4. CENTRAL TENDON HAS BEEN DIVIDED, EXPOSING RECTO-URETHRALIS MUSCLE WHICH IS NEXT DIVIDED

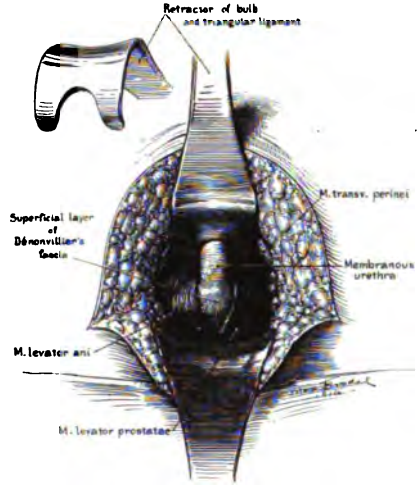

FIG. 5. SPECIAL RETRACTOR OF BULB AND TRIANGULAR LIGAMENT HAS BEEN INSERTED, EXPOSING MEMBRANOUS URETHRA, HELD UP ON TRACTOR

Levator ani muscles next pushed to each side exposing posterior or superficial layer of Denonvilliers' fascia.

FIG. 6. SHOWING THE URETHRAL TRACTOR CARRIED INTO BLADDER, WHERE IT IS OPENED OUT AS SHOWN (*A. B.*)

ering the fascia of Denonvilliers, the anterior layer of which forms the covering of and index to the seminal vesicles and vasa deferentia as well as the prostate. In this exposure the levator

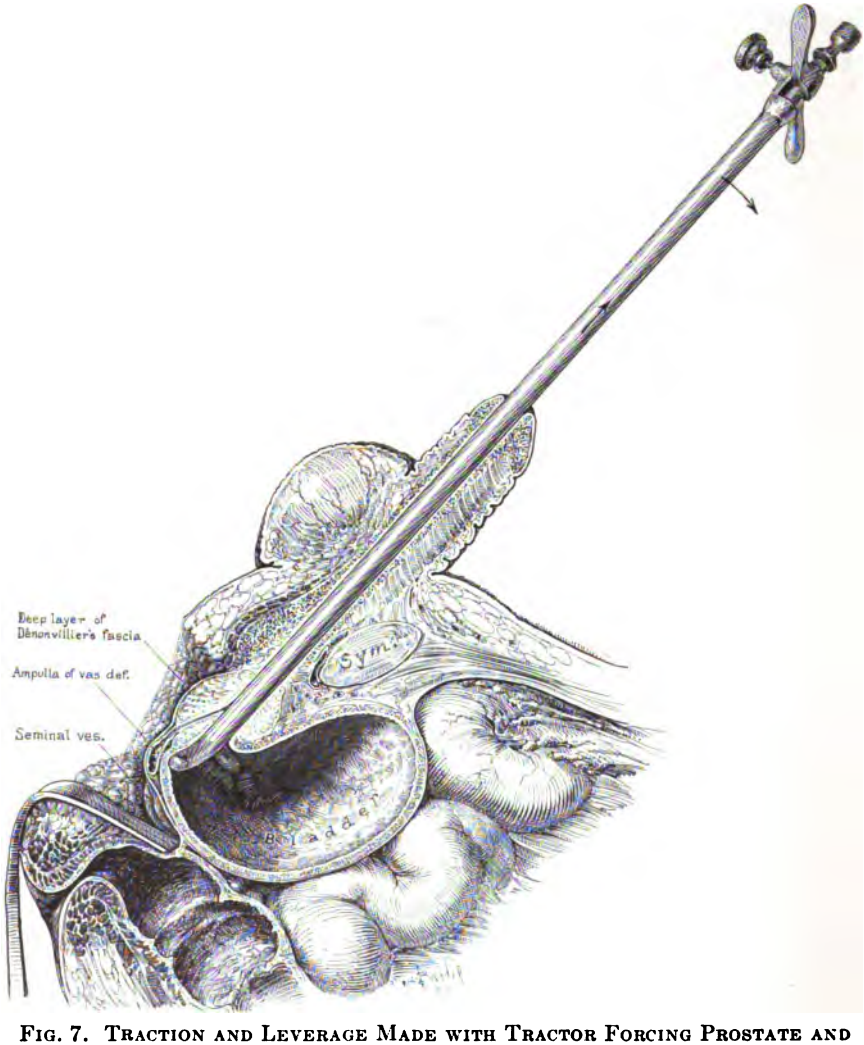

FIG. 7. TRACTION AND LEVERAGE MADE WITH TRACTOR FORCING PROSTATE AND SEMINAL VESICLES INTO THE WOUND

ani muscle is drawn outward and backward with the rectum exposing the superficial or posterior layer of Denonvilliers' fascia,

which is divided near the apex of the prostate, thus uncovering the shining anterior or deep layer of Denonvilliers' fascia. The incision which must now be made through the fascia of Denon-

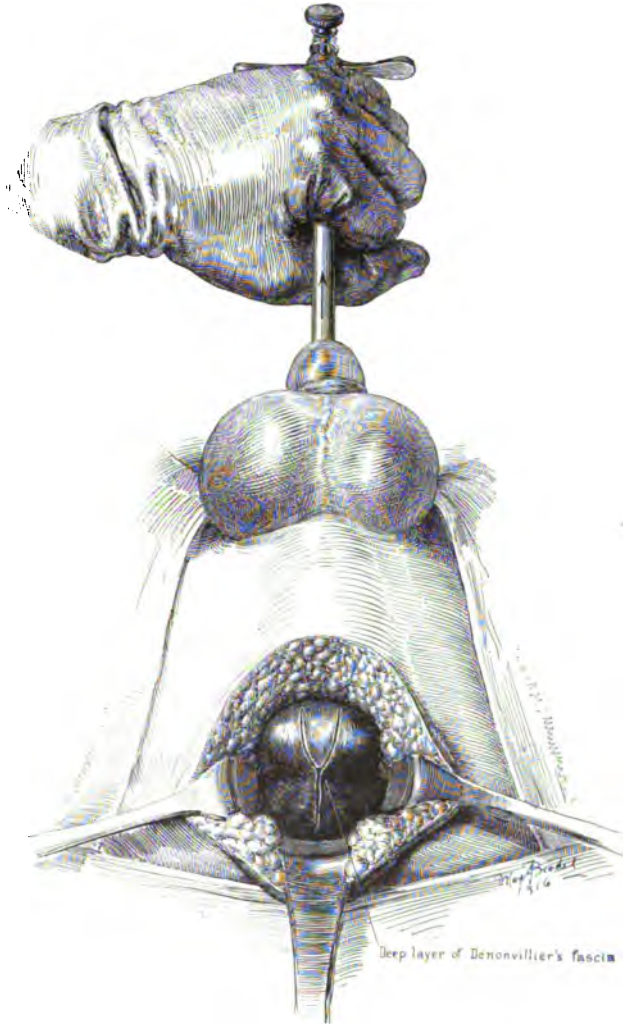

FIG. 8. LEVATORS AND RECTUM DRAWN AWAY, EXPOSING FASCIA OF DENONVILLIERS. Y-SHAPED INCISION THROUGH FASCIA

villiers in order to expose the vasa and seminal vesicles may vary somewhat according to the extent and character of the

involvement, but as a rule a Y-shaped incision (fig. 8) has been found most satisfactory for nearly all cases in which both seminal vesicles, ampullæ and lateral lobes of the prostate are involved. The fascia is then elevated on both sides, thus exposing the lateral lobes of the prostate, ampulla and seminal vesicles, and leaving the central portion of the prostate immediately beneath the urethra (in which the ejaculatory ducts lie) intact and covered by fascia which aids in protecting them. An excellent exposure is thus obtained (fig. 9) and it is possible to determine exactly how much should be removed, whether the disease is unilateral or bilateral, and whether one or both lobes

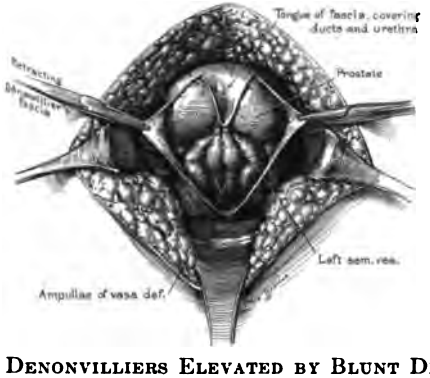

FIG. 9. FASCIA OF DENONVILLIERS ELEVATED BY BLUNT DISSECTOR EXPOSING LATERAL LOBES OF PROSTATE, SEMINAL VESICLES AND VASA DEFERENTIA

of the prostate shall be excised. Another advantage of this method is that the main blood supply which lies externally is thus drawn outward with the fascia and hæmorrhage is avoided, making it possible to see well and to carry out a delicate and accurate blunt dissection without injury of the bladder, to which the ampullæ and vesicles are often very adherent. The vas deferens should be freed well up toward the point where it winds around the ureter and then deeply clamped and divided, the upper clamp being left attached to assist in removal of the upper portion of the vas deferens, in case epididymectomy or castration is contemplated. The seminal vesicle on this side is then freed, firm adhesions being clamped and ligated after

division in order to prevent bleeding, and, working from above downward, the seminal vesicle and ampulla are freed until the juncture with the upper portion of the prostate is reached (fig. 10). If it seems desirable to remove a portion of the prostate, an incision is made parallel to and at a distance of 5 millimeters from the urethra (and dividing the ejaculatory duct) but leaving sufficient tissue to avoid a urinary fistula (fig. 11). After this, the prostatic tissue is easily removed by enucleation from within its capsule, and the fascia, ampullæ, seminal vesicle,

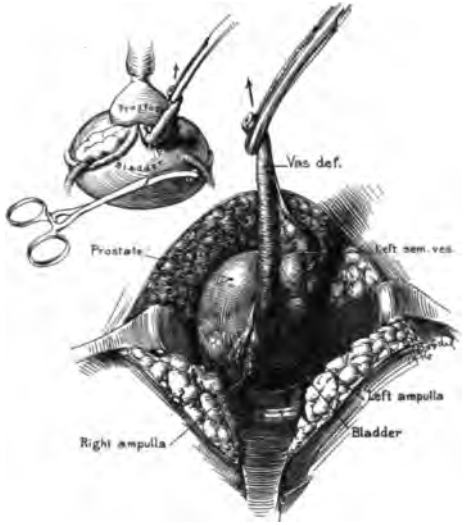

FIG. 10. LEFT SEMINAL VESICLE FREED, VAS DIVIDED BETWEEN CLAMPS

and lateral lobe of the prostate are thus removed in one piece as shown in the illustration (fig. 22). If the disease is bilateral the same procedure is carried out on the opposite side (fig. 21) working from above downward and not separating the ampullæ and vesicles from each other, but removing in one piece the vesicles, ampullæ and lateral lobes of the prostate as shown in photographs of specimens removed. The wound is then partly closed, the long clamps being left attached to the upper ends of the vasa deferentia for traction later. In this closure two iodoformized gauze drains are provided (fig. 14), and the

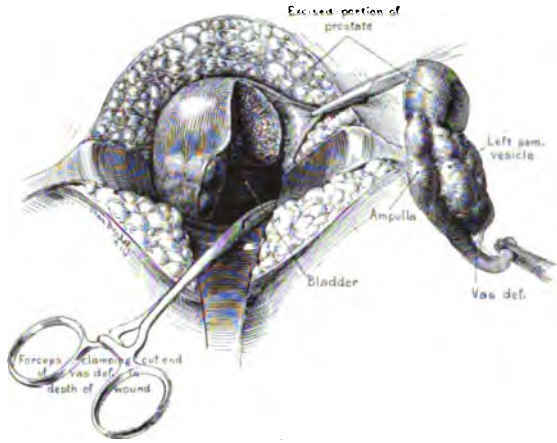

FIG. 11. VAS, VESICLE, AND MOST OF LEFT LATERAL LOBE OF PROSTATE HAVE BEEN REMOVED IN ONE PIECE

Note division of ejaculatory duct near urethra

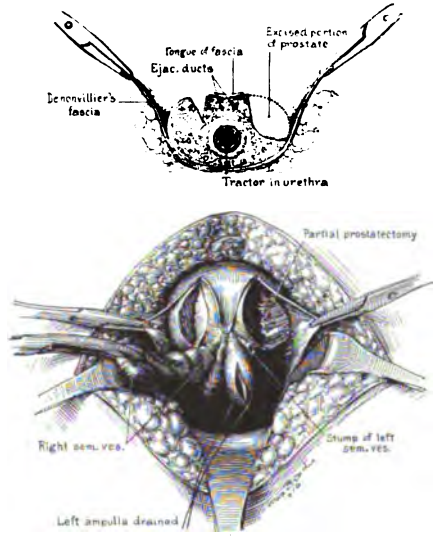

FIG. 12. VARIATION: LEFT VESICLE AND LOBE OF PROSTATE EXCISED, AND VAS DRAINED. RIGHT VESICLE BEING FREED

Note line of incisions in prostate

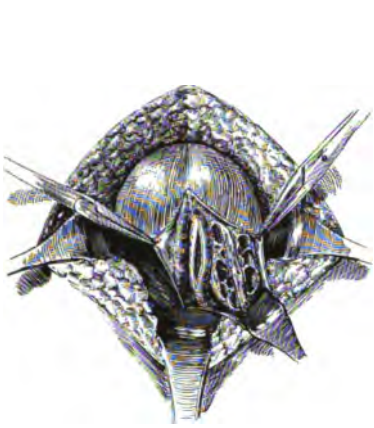

FIG. 13.

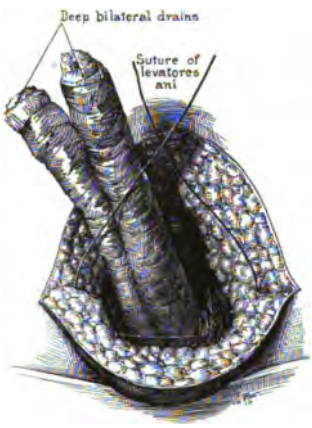

FIG. 14.

FIG. 13. VARIATION: SHOWING DRAINAGE OF VAS AND VESICLE FOR CHRONIC INFLAMMATION

Posterior wall of vesicle excised

FIG 14. SHOWING DRAINAGE AND SUTURE

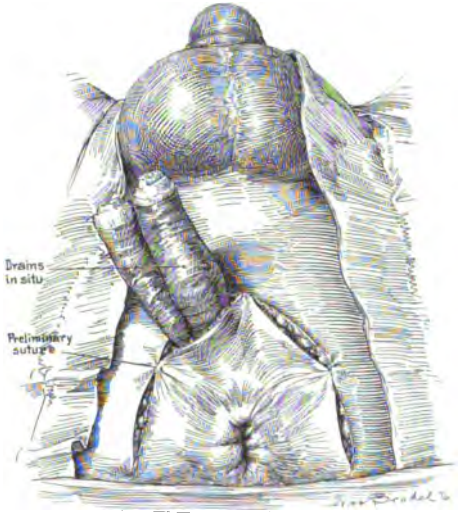

FIG. 15. SHOWING CLOSURE AND DRAINAGE OF PERINEAL WOUND

wound closed as in prostatectomy, leaving room for drainage (fig. 15). The patient is then placed on his back with legs separated and epididymectomy or castration carried out according to the extent of the lesion present. This is also so well shown in illustrations that detailed description seems unnecessary. The incision is usually made along the cord just below the external ring (fig. 16) and, after division of the dartos, the testicle is delivered (fig. 17), the tunica vaginalis opened (fig. 18), separation of vas and epididymis from veins and testicle carried out, and finally, division at the upper end of the epididymis made

FIG. 16. INCISION IN GROIN
Patient in horizontal position on back

with a cautery (fig. 19). After suturing the tunica vaginalis behind the testicle so as to avoid hydrocele formation, and after careful hæmostasis, testicles and veins are dropped back into the scrotum and the vas deferens, which has been exposed up to the external ring, is then freed from adhesions in its canal by a to-and-fro traction (fig. 20), produced by an assistant pulling upon the clamp (which we mentioned above as being left upon the lower end of the vas deferens), alternating with traction by the operator upon the vas deferens in the groin. In this way the vas is quickly freed, and, the assistant having liberated the vas from the clamp, the vas is easily drawn out in its entirety through the groin, as shown in the illustrations (fig. 21). In

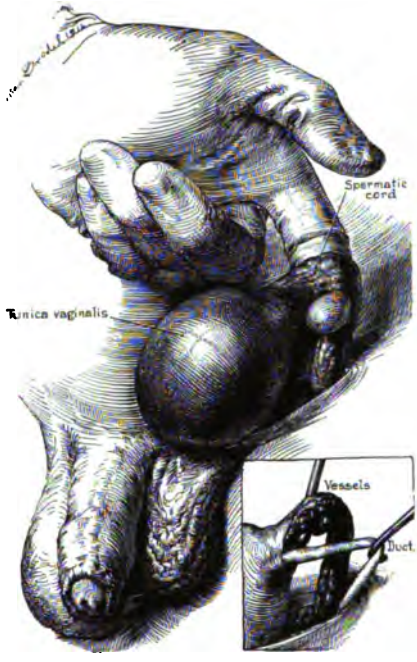

FIG. 17. CORD AND TESTICLE DELIVERED
Separation of vas from vessels

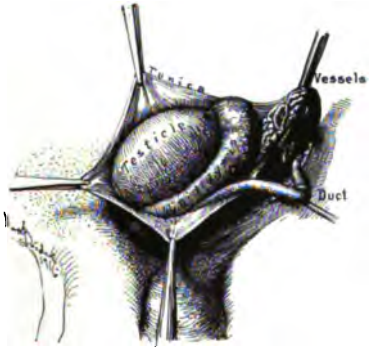

FIG. 18. TUNICA VAGINALIS OPENED, EXPOSING TUBERCULOUS EPIDIDYMIS

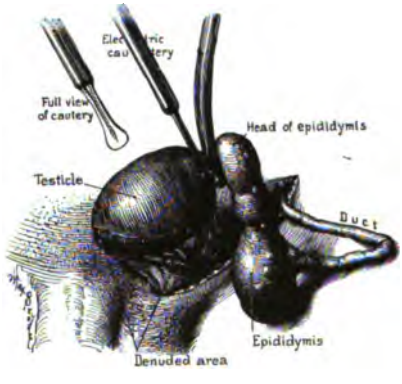

FIG. 19. EXCISION OF EPIDIDYMIS COMPLETED WITH ELECTRO-CAUTERY

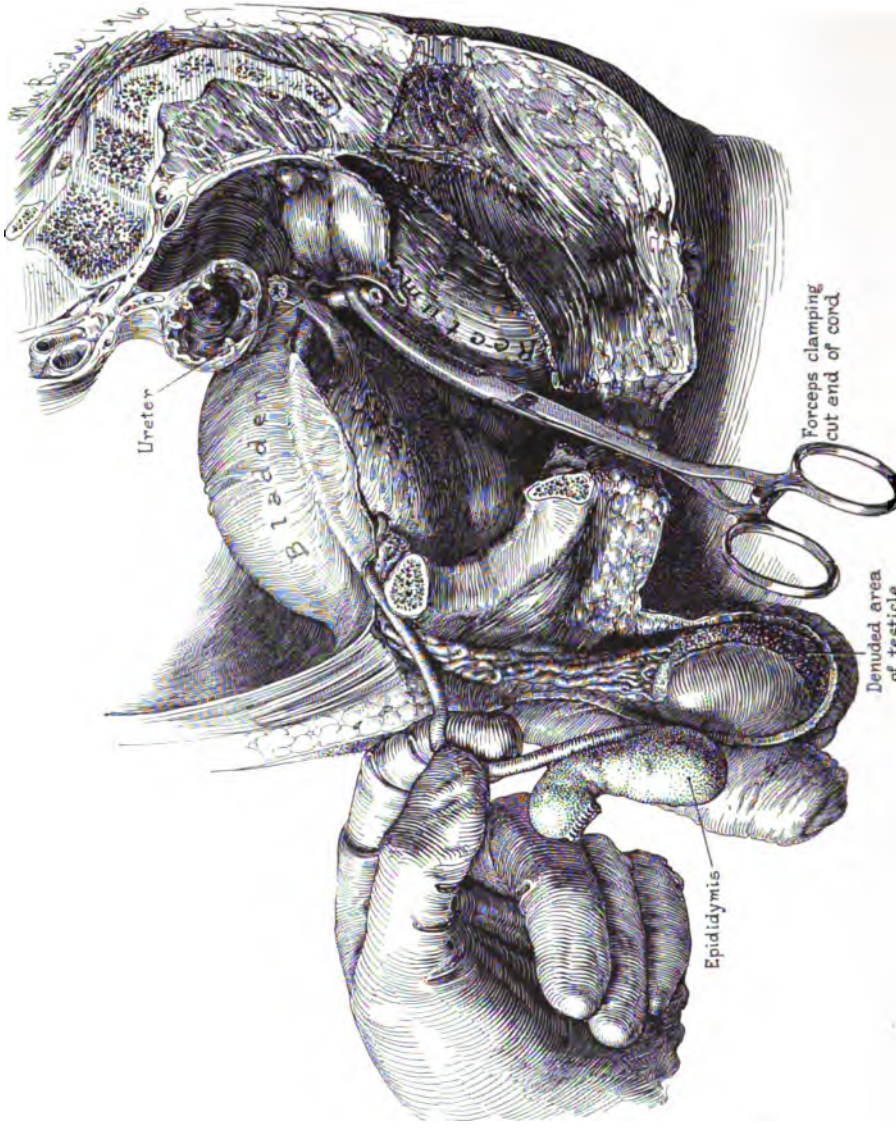

FIG. 20. SHOWING METHOD OF TRACTION (ALTERNATING BETWEEN OPERATOR IN GROIN AND ASSISTANT PULLING ON CLAMP IN PERINEAL WOUND ON VAS) BY WHICH VAS IS FREED AND THEN DRAWN OUT THROUGH INGUINAL CANAL

FIG. 21. CASE IV, No. 4322, B. U. I.

Photograph of specimen showing removal of both vesicles, vasa and lateral lobes of prostate; median portion and urethra preserved. Castration on one side, epididymectomy on other.

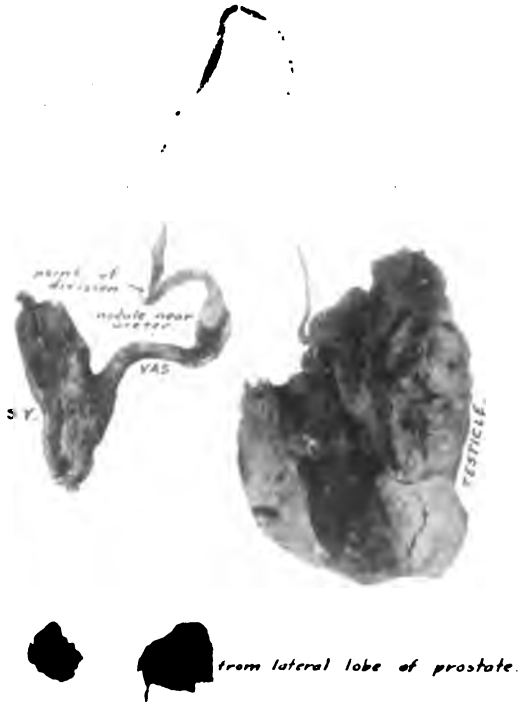

FIG. 22. CASE III, No. 3632 B. U. I.

Testicle with surrounding inflammatory tissue, vas, seminal vesicle, and a portion of prostate removed.

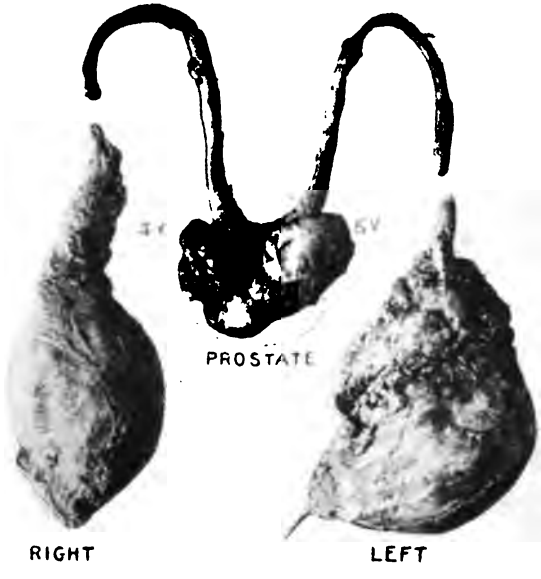

FIG. 23. PHOTOGRAPH OF FIRST TOTAL EXCISIONOF SEMINAL TRACT (BILATERAL) AND PART OF PROSTATE EVER PERFORMED (1900) (20)

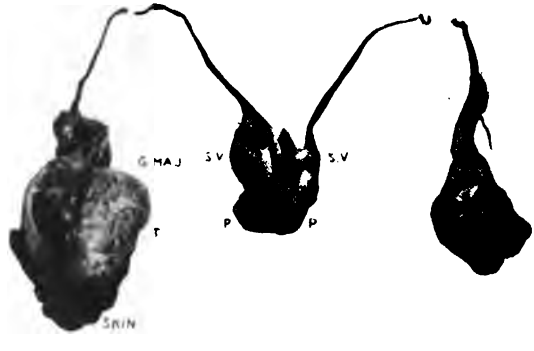

FIG. 24. PHOTOGRAPH OF SPECIMEN FROM SECOND CASE REMOVED BY SUPRAPUBIC RETROCYSTIC EXTRAPERITONEAL ROUTE

this way we have a complete and radical removal of the entire seminal tract, with the exception of a few millimeters, the terminal portion of the ejaculatory duct, and we have also a conservative prostatectomy, leaving the urethra and bladder intact. This procedure, which is thorough and radical, is carried out with ease and is entirely under visual control.

The illustrations (figs. 25 and 26) show first of all the impossibility of satisfactory drainage through the natural passages in cases of tuberculosis of the seminal vesicles and the ampullæ and

FIG. 25

FIG. 26

FIG. 25. INJECTION OF VESICLES WITH THORIUM

Roentgenogram showing tortuous cavities and impossibility of adequate drainage.

FIG. 26. CORROSION SPECIMENS SHOWING MULTIPLICITY OF CAVITIES IN VESICLES

epididymes. The tortuous, sacculated character of these structures is graphically shown in dissections, corrosion specimens, and X-ray photographs after the injection of thorium nitrate. The importance of operations upon the vesicles in these conditions is clear.

V. HISTORIES OF FIFTEEN CASES OF EXCISION OF SEMINAL TRACT

A brief account of each of these cases, with operation, pathology and results is presented herewith. Later on an analysis appears.

Case I. C. K. No. 3515 B. U. I. Age 28. Single. Admitted April 10, 1913.

Complaint: Pus in urine. Twelve years ago had fever and night sweats and lost weight, but no hemoptysis. Gonorrhea eight years ago, lasted six weeks complicated by rheumatism. No renal colic, stone nor hematuria.

Present illness: Two months ago was examined by physician who found pus in urine and tubercle bacilli. Cystoscopy and ureteral catheterization by physician in New York was reported to show tubercle bacilli from the right kidney. He now suffers no pain, feels perfectly well and voids urine normally and has passed no blood.

Examination: The right kidney is apparently distinctly enlarged and feels firmer than normal, left kidney is negative. Both testicles, epididymes, cords and groins are negative. Prostate is normal in size, smooth, not indurated or tender. Both seminal vesicles are negative. Urine clear, microscopically only an occasional leukocyte, no tuberculosis found. Cystoscopy: No residual urine. Bladder capacity 380 cc. No stricture. Left ureter is normal in appearance. Right ureteral ridge is slightly swollen and mucous membrane around the orifice is edematous. On the anterior wall of the bladder, very small red areas are seen in the mucous membrane. No ulceration visible. Rest of bladder negative. Prostatic orifice negative. Ureteral catheterization: right side: urine cloudy, microscopically: epithelial cells, an occasional leukocyte. No bacteria found. Urine from left side is clear, microscopically negative.

Patient is advised to go to a mountain resort, Saranac Lake. Here pus and acid fast bacilli were found in urine, but animals injected with the purulent urine did not die of tuberculosis.

March 24, 1914. Letter from physician. "Last catheterized specimen of bladder urine contained numerous tubercle bacilli." One month ago and two days after intercourse there was a slight pain in the upper end of the left epididymis. Next day the swelling had increased very rapidly so that there was a marked enlargement which seemed to involve the entire testicle and was very tender. Swelling has remained but the pain has now disappeared. No difficulty or frequency of urination.

Examination: Urine voided in three glasses is clear, contains only a few fine shreds in all three glasses. No urethral discharge. Right testicle, epididymis and vas are normal. Left side of scrotum is enlarged and reddened; there is a small hydrocele but testicle does not seem enlarged or indurated. The entire epididymis is greatly enlarged,

markedly indurated and moderately tender, but not adherent to the skin. Vas deferens slightly enlarged, smooth and slightly indurated. Rectal: Prostate is normal in size and consistence. Right seminal vesicle is palpable possibly very slightly indurated and adherent. Left seminal vesicle is indurated, inner side of the vas deferens can be palpated for a distance of about 3 cm. above the prostate, moderate adhesions are present.

Remark: We are dealing with a definite tuberculosis of the left epididymis, vas and seminal vesicle. Presence of tuberculosis of right kidney is probable. It seems wise to carry out an excision of seminal tract.

April 6, 1914. Operation. Young. Nitrous-oxide, oxygen-ether. Removal through perineum of left seminal vesicle and ampullæ and a portion of both lobes of prostate. Right seminal vesicle, ampullae and prostate not disturbed. Removal through incision in left groin of left epididymis with a portion of the skin around the discharging sinus and the entire vas deferens. The testicle was found not to be involved, was not disturbed. Both wounds were packed and partially closed.

Pathological report: Extensive tuberculosis of the epididymis and lower portion of seminal vesicle; ampullae of vas deferens markedly tuberculous, rest of vas deferens not involved.

May 14, 1914. It is now five and one-half weeks since operation. Patient discharged from the hospital today. Convalescence satisfactory. No urinary leak through perineum. Both wounds granulating nicely, no fistula. Left testicle is only slightly indurated. Patient retains urine for three or four hours and voids freely without pain. Has had no pain in the region of either kidney. General health excellent. No cough, expectoration or pyrexia.

February 6, 1915. Patient has been treated by tuberculin and his general health has greatly improved. Patient's chief complaint is the persistence of two small discharging sinuses. Urine is clear and contains microscopically only a few pus cells and no tubercle bacilli. X-ray plates of kidneys are negative. Examination of the chest negative. Kidneys are not palpable nor tender. There is a small sinus in the scrotum. Perineal wound healed solidly. Rectal examination shows a slight cicatrix, no evidence of tuberculosis.

February 25, 1920. Patient returns for observation, says his general health is excellent, he feels completely cured. Sexual powers quite normal, has intercourse every week. Passes urine every three or four hours, micturition normal. No pain in either kidney. No fever, chills

or night sweats. Genitalia: Right testicle, epididymis and vas are normal. Left testicle normal size, smooth and soft, epididymis and vas are absent. No sinus. Rectal: Prostate about normal in size and consistence, slightly indurated at upper end. Right seminal vesicle is apparently soft and normal. Left seminal vesicle absent; slight induration in that region.

March 5, 1921. Letter: "It is now seven years since operation. I am apparently completely cured, my only complaint being a slight irritation at neck of bladder lasting a few seconds after urination. Urine voided normally about every three hours and once at night. I have had no trouble with my kidneys. Sexual powers normal. Urine contains pus. My physician still thinks that I may still have an infection of the right kidney."

Case II. L. J. R. D. No. 4158 B. U.I. Age forty-two. Married. Admitted February 17, 1914.

Complaint: Swollen testicle.

Past history: Gonorrhea at age of twenty-five and again at age of forty. Syphilis at age of thirty-seven, treated by internal medicine.

Present illness: Four months ago during "convalescence from typhoid" left testicle began to swell. It was only slightly painful in the beginning and since then there has been no pain except during the last few days. No complaint referable to bladder or kidneys noted.

Examination: Patient of apparently excellent physique. Chest: no definite areas of dullness; no increased fremitus. However, there are numerous râles of coarse character over both bases, especially marked between the fifth and sixth ribs, posteriorly. Heart: negative. Abdomen: negative. Genitalia: penis normal. Right side of scrotum is normal. Left side filled with a large rounded mass consisting of hydrocele and considerably enlarged indurated, nodular epididymis. Testicle cannot be made out in the hydrocele. Vas deferens is indurated and enlarged. Rectal examination: Prostate is enlarged on the left side, nodular and very hard. Right lobe of prostate negative. The left seminal vesicle is also considerably enlarged, indurated and nodular. The right seminal vesicle is only slightly indurated and not enlarged.

Urine: Contains a few pus cells but no bacteria are present. One per cent tuberculin test positive; Wassermann and luetin tests negative. Phthalein test: Appearance time, ten minutes. First hour 50 per cent; second hour 38 per cent. Cystoscopy: bladder normal. Ureters catheterized; urine from both sides clear, microscopically negative.

Impression: Tuberculous epididymitis, vasitis, left seminal vesiculitis and left lobe of prostate. Radical operation indicated.

February 27, 1914. Operation: Young, ether, radical operation. Excision through perineum of left seminal vesicle, ampulla of vas and left lobe of prostate. Removal through left inguinal incision or left testicle, epididymis, cord and the remainder of the vas deferens. Complete closure of incision; partial closure of perineal incision with gauze packs.

Remark: The left seminal vesicle and left lobe of prostate were greatly distended with pus which escaped during the operation.

Pathological report: Left seminal vesicle and 2 inches of ampulla attached, both markedly tuberculous. Prostatic tissue removed weighed 5 grams, markedly tuberculous. The testicle and epididymis also markedly tuberculous.

Convalescence: Patient made an excellent recovery from operation and was discharged March 22, 1914 with perineal fistula through which a small amount of urine escaped at times.

Second admission: April 13, 1914. Complaint: Persistent perineal fistula, fever and night sweats. Examination: Shows small fistula in perineum through which urine escaped. Rectal examination: showed slight induration of the right lobe of the prostate and of the right seminal vesicle. Left seminal vesicle and left lobe of prostate absent. Moderate cicatrix. No fluctuation; no evidence of abscess. Patient remained in hospital until July 20, 1914. During this time he continued to have fever which ranged between 100° and 102.5° at night. His urinary condition seemed excellent. Beck's paste used to inject into fistula; ineffectual. Temperature indicated deep-seated tuberculosis, probably of lungs, but not definitely made out. Urinary tract negative.

Third admission: January 28, 1915. Complains again of perineal fistula. Has had night sweats off and on since last discharge. For the past two months has had pain in chest and swelling on the left side of sternum in the region of the second rib.

Examination: Patient is emaciated, anemic, pale. At the junction of the second costal cartilage with the sternum there is a rounded fluctuating mass about the size of a small hen's egg which is not tender. Chest of flat type; infra-clavicular fossa well marked; expansion poor. Percussion note and vocal fremitus greater on the right than on the left. Expiration harsher and more prolonged on the right than on the left. Kidneys not palpable nor tender. Genitalia: Penis normal.

Left side of scrotum: Testicle absent, small discharging sinus. Right testicle normal in size, shape and consistence. Right epididymis is slightly enlarged, irregular, indurated throughout. Vas deferens is about three or four times normal size, indurated up to external ring. In the perineum there is a scar and urinary fistula. Rectal: Right lobe of prostate slightly irregular, indurated and adherent. In the region of the left lobe there are adhesions which obscure the outline of the prostate. Tissues not greatly indurated here nor enlarged. The right seminal vesicle is moderately indurated, enlarged and adherent. On the left side the testicle is absent and there is only moderate cicatrical induration. The rectal wall is negative.

February 7, 1915. Impression: Patient apparently is going down hill and has tuberculosis of the remaining seminal vesicle also of the right epididymis. There is also apparently involvement of the lung and probably of the chest wall. It is thought wise to carry out epididymectomy under local anesthesia and to inject the seminal vesicle with iodoformized oil through the vas deferens into the groin.

February 8, 1915. Operation: Frontz, novocaine 1:400, local anesthesia. Incision in groin, testicle and cord withdrawn. Epididymectomy, removal of vas up to the groin. Wound closed.

Pathological report: Examination of tissue showed extensive tuberculosis of epididymis.

February 11, 1915. Since operation patient has suffered with continuous hiccoughs. Temperature which before operation rose to 102° or 103° every evening has only risen to 99°. The fluctuating mass in the chest wall has increased and now measures 8 by 13 cm. in size and extends from the lower border of the first rib to the upper border of the fourth rib on the left side of the sternum. This was aspirated for diagnosis and pus withdrawn—no tubercle baccilli nor other bacteria found in it. Abscess was then incised and about two ounces of pus evacuated. Cultures negative.

February 13, 1915. X-ray of chest today shows a mediastinitis. Generalized involvement of both lungs especially the upper left with slight, pleural thickening over this region. Both apices are infiltrated, with some clouding of the right. There is a small consolidated area in the left upper lobe above the third rib. The right side of the diaphragm is "hooked up."

February 20, 1915. Hiccoughs have persisted. Evening temperature between 98° and 101°. Today a fluctuating swelling 3 by 5 cm. appeared beneath skin of the right shoulder above the acromio-clavic-

ular joint. This was incised and about an ounce of greenish yellow pus evacuated.

March 8, 1915. Patient has had no hiccoughs for the past ten days. Wounds in shoulder and chest wall still discharging. Daily evening pyrexia, yesterday 101.8°. Perineal fistula not yet closed. No sinuses in groins or scrotum. Patient discharged. Owing to the extensive involvement in the chest, prognosis bad.

One month after leaving hospital patient died.

Comment: At the present time such a case, with involvement of lungs, would not be given a general anesthetic, but local anesthesia would be employed as in case No. 12.

Case III. M. L. No. 3632. Age 23. Single. Admitted June 1, 1914. Complains of pain in scrotum. Patient denies gonorrhea. Ten months ago was treated for sexual weakness by urethroscopic applications of nitrate of silver to the verumontanum and received a few massages of the prostate, which were discontinued on account of pain. He received no further treatment until February 1, 1914 when right "testicle became swollen and tender." There was no urethral discharge and a urologist diagnosed the condition as "lues." Wassermann was positive and patient received two injections of salvarsan. Enlargement did not diminish after salvarsan and remained hard and tender. Patient has had no fever, no cough, no frequency or difficulty of urination nor hematuria.

Examination: Patient is pale and thin. Chest normal, expansion free, lungs negative, heart negative, abdomen negative. Urine voided in three glasses clear with numerous shreds in third glass. Careful examination for tubercle bacilli negative. Tuberculin eye test positive. Genitalia: No urethral discharge; penis normal; left testicle normal; epididymis slightly tender but not indurated. On the right side the scrotum is considerably swollen; testicle surrounded by hydrocele but apparently soft and normal. Right epididymis enlarged throughout and about one inch in diameter, hard, tender, no adhesions to the skin, no sinus. Vas deferens apparently normal in size, only slightly indurated and not tender. Rectal examination: Left lobe of prostate enlarged, very hard, particularly at upper end; right lobe hard with slight enlargement at upper end. Lower portion of right lobe apparently normal. The right seminal vesicle is a little broader than normal, slightly irregular, slightly indurated and adherent. The left seminal vesicle is soft in its upper portion, slightly indurated and adherent,

lower portion apparently not enlarged. Neither vas deferens can be made out distinctly.

June 5, 1914. Operation: Young. Nitrous oxide, oxygen and ether. Radical operation: Removal through perineum of right seminal vesicle and both lateral lobes of the prostate (all of which were tuberculous), urinary tract not opened. Right castration and removal of remainder of right vas deferens (fig. 22). Wound in groin closed completely. Perineum partially closed, packed with gauze.

Pathological report: Specimen consists of right seminal vesicle and ampulla 11 cm. long, two portions of lateral lobes of prostate, testicle, epididymis and vas 17 cm. long. Seminal vesicle indurated, nodular and filled with brownish serum. Ampulla contains a large yellow nodule containing creamy pus. Right lateral lobe of prostate contains numerous tuberculous areas. Left lateral lobe of prostate fibrous, no tuberculosis seen. Testicle and epididymis both contain numerous areas of caseous tuberculosis.

Convalescence: Fever 102° on the fifth day, after that soon returned to normal. All drains removed on fifth day, no urinary leakage.

June 26. Convalescence uneventful. There has been no urinary leakage since operation. Wound healed. Patient discharged in good condition.

January 13, 1916. Now seventeen months since operation. Patient returns much improved. Retains urine five hours and does not have to void at night, no urinary symptoms. No perineal urinary fistula. Right testicle and epididymis missing, left testicle, epididymis and vas negative. Rectal: Right seminal vesicle and left lobe of prostate (excised at operation) moderately indurated, cicatrix; left seminal vesicle slightly enlarged and indurated. Urine negative, careful search for tubercle bacilli—none found.

June 28, 1916. Patient returns complaining of recent swelling of left epididymis. General condition otherwise good. No urinary symptoms, no sinuses or fistulae. Examination shows left testicle normal, globus minor of epididymis markedly enlarged, indurated and tender, swelling almost entirely limited to the globus minor. There is a slight induration of the globus major, vas slightly indurated, nodular and enlarged. The left seminal vesicle is markedly adherent, indurated and tender. Prostate negative. Right vesicle absent, moderate cicatrix. Urine clear, a few shreds.

June 30, 1916. Operation: Colston. Left epididymectomy through incision in groin. Globus minor found markedly enlarged

with small abscess between it and the testicle. The globus major and testicle apparently negative. Complete epididymectomy with removal of vas in groin. Stump cauterized with carbolic and ligated. Wound closed, no drain.

July 8, 1916. Discharge note. Patient left hospital in six days. Post-operative course uneventful. Wound healed per primam. General condition excellent.

March 8, 1921. Numerous questionnaires have been sent patient. None returned, evidently have been received; impossible to get any information as to condition. Probably alive but outrageously unappreciative. Apparently good result obtained.

Comment: In this case and also in case II both seminal vesicles and ampullæ should have been removed. This would almost surely have prevented the subsequent involvement of the remaining epididymis, and possibly have saved life in case II.

Case IV. J. E. No. 4322 B. U. I. Age twenty-eight. Admitted April 17, 1915, complaining of urethral fistula. No history of pulmonary disease. Gonorrhea seven years ago and again three years later and for a third time one year ago. After about three weeks after the beginning of last attack patient had pain and swelling in the perineum and urination became difficult, catheter being required for two weeks. Shortly after patient developed enlargement of both sides of the scrotum. In December, 1914, the swelling in the perineum recurred and an operation was performed evacuating an abscess. Since then patient has had perineal urinary fistula. Two weeks later "left testicle became soft and ruptured" leaving a discharging sinus. "The right testicle" remained swollen but not broken down. Patient voids urine with considerable difficulty but most of the urine comes through the meatus, a small amount through the perineal fistula. Urinary stream is weak and small, but he has no increased frequency of urination, does not void at night, no history of renal pain or hematuria. Sexual powers normal.

Examination: Patient is a poorly nourished, pale man. Chest expansion good and equal on both sides. Heart negative. Abdomen: Neither kidney palpable nor tender. Genitalia: Penis negative. Left testicle normal in size, no hydrocele. At the lower end of the scrotum on the left side are two sinuses from which pus is escaping. They evidently connect up with the globus minor of the epididymis. The globus minor is enlarged, about 1 inch in diameter and markedly

indurated. The body and globus major of the epididymis are apparently not enlarged nor indurated. The vas deferens is slightly indurated, but not nodular nor enlarged. On the right side there is considerable swelling of the scrotum, no sinus. There is a small hydrocele, the testicle is tender, size not accurately made out. The globus minor of the epididymis is greatly enlarged, about 1½ inches in diameter and adherent to skin, at places fluctuating. The body and globus major are also considerably enlarged, indurated and tender. The vas deferens is indurated, but not enlarged. In the perineum there is a small fistula through which urine escapes. Rectal: The prostate is broader than normal, irregular, indurated and adherent. The right seminal vesicle is considerably enlarged, indurated and adherent externally. The left seminal vesicle is also much enlarged, indurated and adherent. Between the two there is an area of induration. Urine: Cloudy, 1011, acid reaction, leucocytes. Cystoscopy: The cystocope entered with ease, no stricture. Residual urine about 130 cc. Bladder slightly trabeculated, otherwise negative. Ureteral orifice negative; both ureters catheterized. The urine obtained was clear and microscopically negative. Phthalein test good and equal.

April 15, 1915. Operation: Young, nitrous oxide, oxygen and ether. Radical operation. Removal through perineum of both seminal vesicles, ampullae and larger portion of each lateral lobe of the prostate in one piece without injury of urinary tract. Excision of perineal fistula. Wound partially closed with drainage. Right castration with a portion of skin of scrotum adherent to epididymis and most of the vas deferens by traction through the groin. A portion broke off and did not come away. Left epididymectomy with an area of skin of scrotum around sinus. Removal of entire vas by traction through scrotal incision. Scrotal wound partially closed with drainage.

Pathological report. Both seminal vesicles, and right ampulla tuberculous. Lateral lobes of prostate not definitely tuberculous, much scar tissue. The left globus minor is definitely tuberculous but the body and globus major are apparently normal and the vas deferens appears normal. On the right side there was a large abscess which apparently involved the globus minor and partially involved the testicle. The remainder of the testicle was apparently normal. Body and globus major of right side also tuberculous. Microscopic confirmation everywhere.

Convalescence: Drains removed on the fourth day. Catheter introduced into the urethra.

April 28, 1915. Patient has been having pyrexia reaching as high as 101°, condition otherwise good. Most of urine is voided through the urethra, perineal fistulae still open. Scrotal wounds apparently healed.

May 10, 1915. Patient continues to have moderate pyrexia every evening. Leucocytes 10,000. Chest negative, cause of fever not explained.

May 28, 1915. Patient discharged. General condition good. Small fistulae in perineum still open and small amount of urine escaping at urination. (This fistula was present on admission and before seminal vesiculectomy.)

March 15, 1921. Numerous questionnaires and letters have been sent to patient. They have not been returned. Patient probably alive but negligent.

Case V. S. K. No. 4330. Age thirty. Married. Admitted April 24, 1915, complaining of swelling of right testicle. No history of venereal disease. No pulmonary history. Present illness began three and one-half years ago with a "small swelling on the side of the left testicle," which gradually became bigger and finally formed an abscess and discharged pus. Consulted a surgeon who performed a left epididymectomy and after that patient remained entirely well until the present time. Two and a half months ago right testicle began to swell and ten days ago a small suppurating sinus appeared. No frequency, difficulty nor pain on urination. No history of pain in either kidney or hematuria. Sexual powers normal until two months ago, since then little desire. Patient's general health is good. Examination: Patient well-nourished, weight 170 pounds. Heart and lungs negative. Kidneys not palpable. Genitalia: No urethral discharge; penis normal; right testicle normal; epididymis indurated and enlarged; a small discharging sinus. Left epididymis absent (previous epididymectomy); testicle negative. Rectal examination: Considerable induration and enlargement of both seminal vesicles and portion of the prostate. Right vas is apparently indurated and enlarged.

April 25, 1915. Operation: Young, nitrous oxide, oxygen and ether. Radical operation. Removal through perineum of both seminal vesicles, both ampullae and a large portion of the right lateral lobe of the prostate, without opening the urinary tract. All tissues removed were markedly tuberculous. Gauze drainage, partial closure. Right castration with removal of all the remaining vas

deferens. Examination seemed to show involvement of testicle as well as epididymis. Scrotal wound drained with gauze and partially closed.

Pathological report: Both ampullae and lateral lobe of prostate markedly tuberculous. Epididymis is tuberculous, but careful examination of the testicle shows no evidence of tuberculosis The testicle was obscured by a hydrocele and very thickened tunica but the testis is normal.

Convalescence: Considerable shock following operation relieved by infusions. Drains removed on fourth day. Perineal wound broke down and was very slow in healing. On discharge three months after operation, patient had a persistent fistula through which all urine came when on his feet. Various methods, including retention catheter, etc., employed without success in closing fistula. Condition otherwise excellent.

September 6, 1916. Now one year since operation. Patient in excellent health with the exception of urinary fistula in perineum. Operation: Excision of fistulous tract—unsuccessful. On discharge still had perineal leakage.

May 27, 1920. Letter: "I void urine entirely without pain about every three hours during day and twice at night. Urine is clear. I have no symptoms referable to either kidney. No fever nor sweats. General health good. With almost every urination, small amount of urine escapes through perineal fistula. Have no bladder trouble."

February 6, 1921. Letter: "Condition same as at last report. General condition excellent. Small urinary fistula persistent. No escape of urine except when voiding and then only a small amount."

Case VI. W. C. No. 4980 B. U. I. Age thirty-four. Single. Admitted March 21, 1916.

Complaint: Swollen testicle and discharging sinus. Pulmonary history negative. Had gonorrhea in 1901, cured in a few days. No epididymitis or stricture.

Present illness: Began three months ago with swelling in the left testicle following traumatism, pain was never very acute. About three weeks ago the swelling was incised and has since been draining pus. No history of any night sweats or loss of weight. Urination and sexual powers normal.

Examination: Healthy looking man. Lungs negative with the exception that in the right posterior base, in the scapular line there is a small area in which inspiration has a tubular character. No râles

heard anywhere even on coughing. Heart negative. Kidneys negative. Genitalia: Right testicle, epididymis and cord are negative. Left testicle is surrounded by a soft hydrocele and is apparently negative. Epididymis shows considerable enlargement throughout its extent and is quite irregular, hard but painless, the point of greatest enlargement is in the globus minor which is about an inch in diameter and from this a small sinus extends through the skin. The left vas is normal. Rectal: Prostate is not enlarged but the right lobe is slightly irregular and indurated. Left lobe is a little larger than the right, quite irregular, almost nodular, moderately indurated and adherent. Induration extends up and is continuous with considerable enlargement and induration of the left seminal vesicle which is nodular and adherent. Right seminal vesicle is definitely palpable but appears soft and not adherent. Urine: Clear; acid; microscopically; a few leukocytes, no bacteria found on several examinations.

Impression: Tuberculosis of left seminal tract and prostate. Radical operation indicated.

April 3, 1916. Operation: Young. Nitrous-oxide, oxygen-ether. Radical operation. Removal through perineum of left seminal vesicle and ampullae and portion of prostate. The rectum was found to be very adherent and a tear was made into it by the finger of the operator, although the tear was extensive it was decided to continue the seminal vesiculectomy, taking great care not to open the urinary tract. The vesicles were easily exposed. An incision was made beginning at the apex of the prostate on the left side and extending back over the left ampulla after raising the fascia of Denonvilliers. The left vesicle and ampullae and portion of left lobe of prostate were removed in one piece. The right seminal vesicle, ampullae and right lobe of prostate were not interfered with. Removal through incision in groin of the entire left epididymis and the remainder of vas deferens. Rectal tear was closed with chromicized catgut, packing was supplied for both perineal and rectal wounds.

Remark: Examination at operation showed that the left testicle was not involved. Left ampullae was markedly tuberculous and about twice normal size, very closely attached to the vesicle. Left lobe of prostate was also markedly tuberculous.

Pathological report: Tissues removed show tuberculosis of left epididymis, vas deferens, left seminal vesicle, left ampulla and portion of prostate removed.

Convalescence: May 20, 1916. Patient operated on forty-seven days ago. The patient carried a retention catheter in the urethra for ten days and the patient's bowels were tied up with lead and opium pills. Regardless of this the rectum broke down and urinary fistula developed and has persisted.

July 18, 1916. The rectal fistula has healed, small amount of urine escapes through the perineum at each voiding. Patient is able to retain urine for normal periods, has no pains and voids freely.

June 13, 1917. Patient enters the hospital on account of urinary fistula. Treated by urethral dilatations. No operation performed. Discharged.

February 1, 1921. Letter: It is now five years since operation. Recto-urethral fistula closed. Perineal sinus persists but there is only a very slight discharge—a few drops of pus a day. No urinary leakage. Urination is normal, can hold urine all night. Sexual powers are normal. No pain after intercourse. Has gained 45 pounds in weight. Urine looks normal, has had no pain in either kidney or bladder. General health perfect.

Case VII. A. R. No. 7933 B. U. I. Age twenty-seven. Single. Admitted July 8, 1919.

Complaint: Bladder trouble. No history of pneumonia, pleurisy or tonsillitis. Gonorrhea twelve years ago, lasted for three months.

Present illness: Began two years ago with pain on urination and passage of blood. Six months later developed an epididymitis on the left side which was opened, pus being evacuated. One month later the right epididymis became involved. During the past six months urination has become gradually more frequent and painful; now voids urine about every hour night and day, has a marked urgency and dysuria. Has a persistent discharging sinus from the left epididymis. No history of renal colic or passage of calculi.

Examination: Patient looks well. Has no cough or expectoration. Thorax: Slight retraction in the region of both apices and an impairment on percussion in that region. Lungs otherwise negative. Heart negative. Lower pole of both kidneys easily felt; apparently no enlargement or tenderness. Genitalia: Right side of scrotum markedly swollen. There is a tense hydrocele obscuring the testicle. The right epididymis is markedly enlarged, indurated, irregular, particularly in the globus minor; vas normal. Left testicle is normal. Epididymis is markedly enlarged and indurated in the globus minor,

globus major being apparently quite normal. Vas is slightly irregular. A small discharging sinus leading to the left epididymis is present. Rectal: Prostate is markedly broader than normal, right lobe is irregular, indurated and adherent. Left lobe is makedly indurated and adherent. Seminal vesicles are entirely obscured by a broad plateau of induration which extends across from one side of the pelvis to the other.

Cystoscopy: Cystoscope enters easily. Bladder capacity 50 cc., irritable. Prostate orifice is slightly irregular but otherwise negative. Trigone contracted. Mucous membrane red with much mucus adherent and floating about, especially around the left ureteral orifice. Vesical mucous membrane generally red and edematous, no ulceration seen.

Ureteral catheterization: On the right side the catheter was easily introduced up to the right kidney. On the left side it was impossible to introduce the catheter. Second attempt at catheterization on July 15: Right side easily catheterized and urine collected. Left side: Catheter met an obstruction 1 cm. above the orifice, no urine collected from left side. Urinalysis of urine collected from right side: Amber; clear; no bacteria; an occasional leukocyte and red blood cell.

August 9. Garceau catheter passed into right ureter. Phthalein test: Appearance time four minutes, urine collected for one half-hour and 40 per cent phthalein excreted. During the same time transvesical phthalein was 5 per cent. Numerous tests for tubercle bacilli negative, nevertheless, diagnosis of tuberculosis of left kidney made.

August 11. Operation: Hain. Nitrous-oxide, oxygen-ether. Left. Nephrectomy, extra-peritoneal for tuberculosis. Ureter brought into the angle of the wound and held there by sutures. Wound closed with drainage.

Convalescence: Satisfactory. Discharged September 6, 1919. Condition much improved, retaining urine two to three hours. Bladder capacity 95 cc. No dysuria. Scrotal condition much improved.

Second admission: December 30, 1919. Patient states that during the past two months, frequency and pain on urination has gradually increased so that he now voids every fifteen minutes. No hematuria or hesitancy. No pain in kidney. Patient states that his sexual powers are good.

Examination: Patient has lost weight, looks bad. Lungs: Both apices are impaired and a few râles are heard. Right kidney palpable

but not tender. Wound on left side well healed. Genitalia: Condition not markedly changed. Globus minor of left epididymis moderately enlarged, very hard and nodular, vas deferens slightly enlarged and nodular. Testicle and globus major left side normal. Right side: Small hydrocele. Testicle normal. Epididymis very much enlarged throughout, very hard and nodular. Vas negative.

Rectal: Prostate slightly indurated and adherent. Both seminal vesicles are much enlarged, very hard, nodular and adherent. Urinalysis: Cloudy; acid; specific gravity 1022. Microscopically: Pus cells and bacilli. Culture: B. coli. Phthalein test: 65 per cent in two hours.

Impression: Extensive tuberculosis of seminal tract. Radical operation advised.

January 7, 1920. Operation: Young. Nitrous-oxide, oxygen-ether. Removal through perineum of both seminal vesicles and ampullae. Retrovesical tuberculous involvement very extensive and the right vas deferens was involved high up and broke away during the dissection. Prostate not involved. Wound packed, partially closed. Removed through incision in left groin of left epididymis and remaining portion of vas deferens. Testicle normal, carefully preserved. Removal through incision in right groin of entire right epididymis and remainder of vas deferens with the exception of about 2 inches and small portion of right testes. Wound closed without drainage on both sides.

Pathological report (fig. 27): Tuberculosis of epididymes, vasa deferentia and both seminal vesicles. Portion of right testicle removed shows marked round cell infiltration evidently chronic inflammatory tissue.

Convalescence: Satisfactory at first. One month after operation the patient was up, wounds well healed. No urinary fistula, voiding about every one and one-half hours.

February 9. Patient complains of discomfort in bladder. Rectal examination shows a fluctuating area above the prostate back of the bladder, this is smooth, soft and not tender. February 18. Rectrovesical cold abscess persists, this was aspirated through the perineum today with a large needle and syringe under the direction of gloved finger introduced into the rectum. 75 cc. of pus evacuated. At the same time a small abscess beneath the skin at the external ring on the left side was opened and drained.

March 9, 1920. There is a small perineal discharging sinus at point of insertion of needle to evacuate the pus. No urinary leakage. Uri-

nary symptoms much improved, interval now three hours. Rectal examination shows that the abscess has not recurred. Region of prostate and seminal vesicles negative. The right testicle is normal, scrotal incision well healed. Cicatrical nodule back of testicle at upper and lower ends. Left side: Testicle normal, small indurated

FIG. 27. CASE VII, No. 7933 B. U. I. SPECIMEN REMOVED AT OPERATION

nodule behind the testis. Small discharging sinus at lower angle of scrotum. Urine: Cloudy; acid; 1012. Microscopically: Pus cells and considerable bacilli; no tuberculosis. Patient advised to live in open air and take food in abundance.

February 1, 1921. Letter: One year since operation. The disease has not progressed, testicles have not become involved. The remaining kidney (right) has given him no trouble. There is a small perineal

sinus which discharges pus but no urine. Erections and sexual powers are good. still continue to have trouble with bladder, void urine about every half-hour night and day. No cough, fever or night sweats. General health poor, but much improved.

Remark: Patient still continues to suffer with cystitis and contracture of the bladder which he had when he came here. His life apparently has been saved by nephrectomy and excision of tuberculosis of entire seminal tract on both sides.

Case VIII. J. K. O. No. 8486 B. U. I. Age fifty-one. Married. Admitted January 26, 1920, complaining of swelling of right testicle and fever. No history of pulmonary disturbance nor of venereal disease. Present illness: In 1911 or 1912 patient began to have slight difficulty and frequency of urination and finally had complete retention and for six days was catheterized twice a day. Six months later retention returned and catheterization was again necessary for a time. He had a distinct hesitancy and slight difficulty of urination with small stream until about October, 1918, when he was operated on for acute appendicitis. He states that after the operation the frequency, hesitancy and dribbling disappeared until the present trouble, which began seven months ago. There is no history of pain in the region of either kidney nor passage of calculi nor hematuria. Seven months ago patient began to have swelling in right side of scrotum and since then has developed a swelling on the left side. In August 1919 epididymotomy was performed on both sides for supposed double epididymitis and since then he has had a suppurative sinus on the left side. At present patient complains of swelling in the scrotum and fever. He has no urinary symptoms and his general health is good. Sexual powers normal.

Examination: Thorax well shaped, equal movements on respiration; lungs normal; heart negative; kidneys not palpable nor tender. X-ray of chest shows moderate amount of fibrosis, slight dilatation of aorta. Genitalia: No urethral discharge; penis negative. Scrotum, right side: Small hydrocele. Testicle normal, epididymis considerably enlarged throughout, markedly indurated, surface irregular, adherent to skin at site of scar. Slight enlargement and induration of vas up to external ring. Left side: Two suppurative sinuses in skin which lead to globus major of epididymis. Small hydrocele; testicle normal; epididymis considerably enlarged, irregular and markedly indurated throughout. Vas apparently normal. Rectal examination:

Prostate moderately enlarged, irregular, moderately indurated throughout. The right seminal vesicle is slightly indurated and adherent, but it is not enlarged nor tender. The left seminal vesicle is considerably indurated, moderately enlarged, induration extending upward and continuous with the markedly indurated prostate. Urine: Slightly cloudy, 1008 acid, no reaction. Microscopically: Leucocytes and tubercle bacilli. Prostatic secretion contains red blood cells and diplococci.

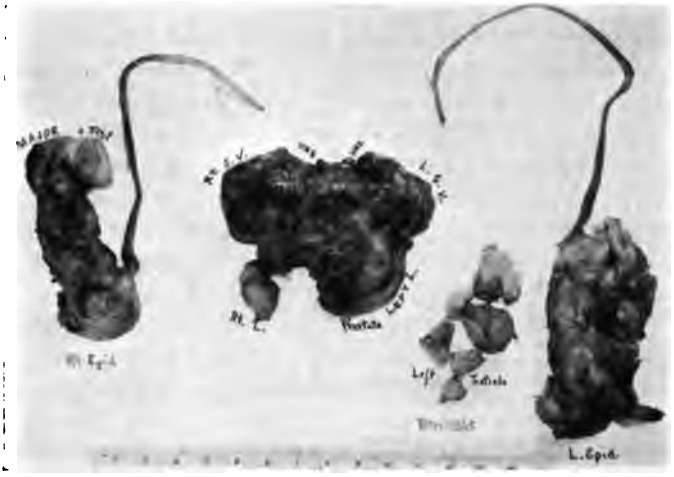

FIG. 28. CASE VIII, NO. 8486 B. U. I. SPECIMEN REMOVED AT OPERATION

January 30, 1920. Operation: Young, nitrous oxide, oxygen and ether. Radical operation. Removal through perineum of both lobes of prostate, both seminal vesicles and both ampullae (fig. 28). Removal through groins of both epididymes and remainder of vas deferens. The left seminal vesicle was very much enlarged, markedly tuberculous. Right vesicle was much smaller but also tuberculous. Right testicle was indurated adjacent to the globus major and a small portion removed. Left testicle was also involved near the epididymis and partially excised. Membranous urethra was torn during the operation. Perineal and scrotal incisions partially closed and drained with iodoform gauze.

Pathological report: Both seminal vesicles, ampullae, prostatic tissue and epididymes are tuberculous.

Convalescence: March 2, 1920. Patient has had a very satisfactory convalescence, both scrotal wounds are healed completely. Both testicles are slightly indurated and enlarged, no fistula nor sinus.

Patient voids urine with ease. Perineal wound healed, no perineal fistula. Rectal examination: Moderate amount of induration in region of prostate and vesicles. Patient is walking about, has no cough and fever which was present before operation has ceased. Urine cloudy in all three glasses. Microscopically: White blood cells and bacilli.

May 22, 1920. Patient returns for observation. Says he has greatly improved in health and strength. Urination normal, no fever, no sweats, no pain. Right testicle normal in size and consistence except slight induration of upper posterior surface. Left testicle slightly irregular, moderately indurated and adherent to skin, no sinus nor suppuration. Rectal examination: Only slight induration in region of operation upon seminal vesicles and prostate, no evidence of tuberculosis. Small perineal sinus discharging pus still present. No urinary leakage. Urine slightly cloudy. Microscopically: A few cocci but no tubercle bacilli.

September 15, 1920. Examination shows no sinuses or fistulae in scrotum. Both testicles negative except slight induration at upper ends.

March 10, 1921. Patient comes for examination. Says he feels apparently well and entirely cured. All wounds are closed. No urinary fistula. General health excellent, no cough, no fever, no sweats. Micturition is normal. Does not have to get up at night. Urine clear, microscopically negative, no bacteria present. Sexual powers normal. Coitus about once a week, ejaculatory fluid less than usual but sensation normal. Examination shows slight induration of the posterior part of both testicles. No evidence of tuberculosis. No sinuses. Perineal wound healed. Slight excoriation of skin from use of suspensory. Has gained 25 pounds in weight. Apparently well.

Case IX. C. R. H., Jr. No. 8525. Age nineteen. Admitted February 17, 1920.

Complaint: Swollen left testicle.

Past history: In 1917 patient had empyema which required an operation—resection of rib and drainage. Two years later the right testicle became enlarged and castration was performed (July, 1919). No history of chronic cough, hemoptysis or night sweats. No history of venereal diseases. Has never had frequency, difficult or painful urination, or hematuria. Sexual history normal.

Present illness: Began four days ago with pain and swelling of the left testicle. No history of injury. He still had a discharging sinus in the right scrotum as a result of the castration performed seven months before. Patient is suffering considerable pain in the left testicle, but there is no frequency of urination, no pain, no hematuria, and his general condition is excellent.

Examination: Patient is well-nourished, height 5 feet and 10 inches, weight 155. Lungs negative on percussion, palpation and auscultation. Heart negative. Abdomen negative. Neither kidney palpable. Penis negative. Right testis absent. Discharging sinus in upper part of scrotum. Left side, testis normal; globus major and body of epididymis negative. Globus minor enlarged, considerably indurated and tender, about 2 cm. in diameter. Vas and veins negative. Urine: Voided in three glasses cloudy with shreds. Microscopic examination shows pus and tubercle bacilli.

February 18, 1920. Cystoscopy: No stricture, no residual urine. Bladder negative, ureteral orifices normal—both catheterized. Urine from each kidney is negative. Separate functional test shows slight reduction on both sides. Pyelograms taken: Kidneys and ureters negative, outline of kidneys normal.

February 25, 1920. There has been a rapid increase in size and induration of left epididymis and a considerable discharge of pus from sinus in right groin. Both the vesicles and right lobe of prostate are considerably indurated and enlarged. Radical excision advised.

March 1, 1920. Operation: Young, nitrous oxide, oxygen and ether. Radical operation. Removal through perineum of both seminal vesicles, both ampullae and both lateral lobes of the prostate (see fig. 29). Urinary tract not opened. Apparently extensive tuberculosis of all tissues removed. Wound closed with gauze drainage. Removal through left groin of left epididymis and entire left vas deferens. Wound closed with drainage. An incision was made in the right groin to investigate discharging sinus which was excised. It was impossible to find the vas deferens and the portion of the vas deferens intervening between the ampulla and inguinal ring therefore remained. Wound in right groin packed with gauze. Patient stood operation well.

Pathological report: Tuberculosis of both seminal vesicles, both ampullae and right epididymis. Prostatic tissue removed apparently not tuberculous. Vas deferens negative.

April 3, 1920. It is now three and one-half weeks since operation. Patient has had satisfactory convalescence. No leakage of urine through perineum. Perineal wound is now closed except for a small sinus. Rectal examination is negative. On the left side of the scrotum is a swollen, inflammatory reaction around the testicle and a small

FIG. 29. CASE IX, No. 8526 B. U. I. SPECIMEN REMOVED AT OPERATION

discharging sinus at site of wound. Discharging sinus in right groin at site of previous castration. General condition excellent. Patient able to retain urine thirteen hours. Urination normal. Urine slightly cloudy with leucocytes and a few bacilli. No tuberculosis.

April 9, 1920. Patient has been treated for four days with bladder irrigations followed by instillations of 1 per cent Mercurochrome-220 twice daily. The urine is now free from infection. Patient discharged.

April 16, 1920. Returns for observation. Less swelling of left testicle. Small discharging sinus on left side of scrotum. Perineum closed.

March 12, 1921. Letter: General health good. Excellent result, no urinary fistula. One small sinus in scrotum. Urination normal. No pain. No fever. Erections normal. Urine normal.

Case X. H. T. Z. No. 8561 B. U. I. Age forty-three. Married. Admitted March 8, 1920.

Complaint: Frequent and difficult urination. No previous urinary history.

Past history: Denies gonorrhea or lues.

Present illness: Began two years ago with increased frequency of urination and pain. Six months later received injury on left side followed by hematuria which soon disappeared. About two months ago began to have marked pain in perineum and rectum and then noticed a swelling in upper end of right epididymis which next involved lower end. A little later swelling appeared on left side in the lower end of the left epididymis. After this the upper end of the left epididymis enlarged. An abscess formed on right side and was operated upon, and has since formed a suppurating sinus. He continued to have frequency of urination and one month ago complete retention and catheterized himself several times. Since then he has been treated by prostatic massage, irrigations and occasional passage of sounds. At present he voids urine with pain, about every hour. He frequently has attacks of "renal colic" on left side. Pain is so severe as to require morphia, and radiates towards the groin and bladder and sometimes at head of penis. For past three months has suffered with premature and painful ejaculations. Has lost about 4 pounds in weight. Suffers so greatly from pain and frequent urination that he is incapacitated for work.

Examination: Patient looks healthy. Weighs 150 pounds. Chest: Percussion and auscultation negative except for slight increased bronchial breathing over apices in front and over lower lobes behind. Heart negative. Abdomen negative. No tenderness or enlargement made out in region of either kidney. Genitalia: Penis normal, no urethral discharge. Right testicle normal, right epididymis enlarged, nodular throughout extent. Small suppurative sinus in skin leading to epididymis. Vas and veins negative. Left side: Left testicle apparently

enlarged considerably but somewhat obscured by an inguinal hernia. Epididymis enlarged and nodular. Vas and veins negative. Rectal: Prostate negative. Both seminal vesicles are distinctly enlarged, indurated, nodular and adherent. Urine: Cloudy, acid, 1010, trace albumen, moderate amount of pus, no infection, no bacteria found. March 10, 1920. Cystoscopy. No stricture. No residual urine.

FIG. 30. CASE X, NO. 8561 B. U. I. SPECIMEN REMOVED AT OPERATION

Bladder capacity 225 cc. Marked, diffuse cystitis. Region of right ureter edematous and red. External to this an area covered with mucopurulent exudate is seen. Around left ureter and back of it there is marked reddening and edema with adherent muco-purulent exudate. Both ureters catheterized. Urine from right side cloudy. Stained specimen shows tubercle bacilli from right kidney. Urine from left side clear, no pus, no bacteria.

March 12. Cystoscopy. Study of prostatic orifice shows a small, rounded median bar. Several areas of definite ulceration of bladder are seen, along right and left lateral and posterior walls of bladder. In other places small, definite, tubercles are seen in the mucosa. Pyelograms and ureterograms taken show dilatation of both ureters and both kidney pelves. Plain kidney and bladder plates negative. Impression: Marked tuberculous involvement of epididymes, seminal vesicles and bladder. Slight involvement of right kidney. It seems advisable to carry out excision of tuberculous seminal tract.

March 2, 1920. Operation: Young. Gas, oxygen and ether. Radical operation. Excision, through perineum, of both seminal vesicles and ampullae of vasa and portions of both lateral lobes of prostate (fig. 30) all of which were tuberculous. Excision, through scrotal incision, of right epididymis, entire right vas being removed through the wound. Area of skin around sinus was excised. Castration left side: Testicle markedly involved. Entire left vas withdrawn through wound. Wounds drained and partly closed. Condition excellent.

Pathology: Both seminal vesicles, both lobes of prostate, vasa and ampullæ tuberculous. Left testicle and both epididymes tuberculous.

Convalescence: March 23, patient unable to void. Catheterized three times a day. Retention catheter fastened in place tonight. March, 29, urine began draining through perineum today for first time. Retention catheter subsequently removed.

Note: It seems probable that mistake was made in keeping retention catheter in for a week. April 9, small abscess of left testis aspirated. April 16, patient discharged. Sinus present in both perineum and scrotum. General condition much improved but patient weak.

February 4, 1921. Letter: "Now almost a year since operation. I have had no trouble with my bladder and void four or five times during the day and about four times at night. Urination is not painful and urine appears clear. Have had no trouble with either kidney and the remaining testicle is normal. There is a small sinus in the scrotum on this side. No perineal fistula. Erections and sexual powers are fairly good. Have gained in weight, have no cough and my general health is excellent."

Case XI. A. S. No. 8681 B. U. I. Age twenty three. Single. Admitted April 13, 1920, complaining of swelling of left testicle. No history of pulmonary disturbance, no history of venereal or urinary

disease. No hematuria. Four years before had soreness in the left lumbar region and a second attack six months later. No history of calculi. Present illness began about three and one-half months ago with a small "lump on the left side of testicle" which gradually increased in size and was painful. Three weeks ago it ruptured and since then a sinus has been present. No frequency, difficulty or hesitancy of urination. Sexual powers normal. Examination: A healthy looking man, weight 170 pounds. Tonsils enlarged, no general glandular enlargement. Lungs and heart normal. Kidneys not palpable nor tender. Genitalia: Penis negative; right testicle, epididymis and vas negative. Left testicle normal, considerable enlargement of the epididymis with a sinus through the skin. Vas deferens is indurated and enlarged. Rectal examination: Prostate normal in size and consistence except in region of left ejaculatory duct which is indurated. Left ampulla in distinctly palpable, being broader than normal and moderately indurated and can be followed for about 4 cm. above the prostate. The left seminal vesicle is indurated but not enlarged. Right seminal is soft, apparently normal.

April 21, 1920. Operation: Young, nitrous oxide, oxygen and ether. Radical operation. Removal through perineum of left seminal vesicle and left ampulla. Prostate and right seminal vesicle and ampulla appear to be normal. Urinary tract not disturbed. Removal through scrotal incision of left epididymis with area of skin surrounding discharging fistula. All of vas removed by traction. Both wounds closed with drainage. Patient stood operation well.

Pathological report: Left seminal vesicle markedly fibrous, microscopically tuberculous. Entire epididymis enlarged, tuberculous; vas deferens contains several tuberculous nodules in various places.

May 6, 1920. Convalescence has been very satisfactory. Now fifteen days since operation. Patient is walking. Wound in scrotum healed. There has been no urinary fistula and the perineal wound is almost healed.

Rectal examination: Negative. General condition excellent.

February 15, 1921. Letter: "Two small discharging sinuses are still present, one in the scrotum, the other in the perineum. Only a few drops of pus escape from each daily. No urinary fistula. Urination normal; no pain in the region of either kidney. No fever, no cough. Have gained in weight. Sexual powers are normal. General health excellent."

Case XII. T. C. No. 8712. Age forty-eight. Married.

Patient was admitted on April 20, 1920, complaining of swollen testicle.

Past history: Gonorrhea twenty years ago, apparently cured. Four years ago developed pulmonary tuberculosis and was treated at the Maryland State Sanatorium. Sexual powers normal until three years ago. No sexual desire since.

Present illness. Began six weeks ago with burning in penis before urination. Two weeks later noticed a swelling of the left testicle which came on suddenly but has only been slightly painful and tender. There has been no increased frequency or difficulty of urination; no history of hematuria or pain in region of either kidney. Patient has not lost weight.

Physical examination: Fairly healthy looking man, height 5 feet 11 inches, weight 158 pounds. Thorax: Right side of chest moves more than left on respiration and has an increased vocal fremitus on the right side over the back. Percussion note equal on both sides. Auscultation shows a few râles over the right apex. There is nothing over the apices in the back. Heart: Negative. Abdomen: Negative. Genitalia: The left side of the scrotum has a hydrocele obscuring the testicle. Left epididymis is considerably enlarged and indurated throughout its entire extent. On the right side there is a fairly large hernia present; testicle and epididymis appear normal. Perineum: Posterior part of the perineum to the left of the median line and in front of the anus has an irregular, necrotic superficial ulcer of the skin, probably tuberculous. Rectal: Prostate is not enlarged or indurated. Left seminal vesicle is indurated, enlarged and adherent. Right seminal vesicle apparently negative.

Urine: Slightly cloudy. Reaction acid, specific gravity 1024, no pus, no infection present, no tubercle bacilli found. Phthalein test: Appearance time, ten minutes, 50 per cent first hour, 5 per cent second hour, total 55 per cent.

Impression: Tuberculosis of the left epididymis (possibly testicle), vas deferens and left seminal vesicle. Radical excision of the left seminal tract advised, but owing to tuberculosis of the lungs, general anesthetic should not be given.

April 26, 1920. Operation: Young; infiltration anesthesia, 1:400 procaine with occasionally small amounts of gas. Excision of left seminal vesicle, ampulla of vas through perineum, left castration and removal by traction of the remainder of the vas deferens through scrotum. Both wounds packed.

Remark: An area of tuberculosis of the skin in perineum was excised before exposing the prostate through the perineum. Local anesthesia very satisfactory; only occasionally was it necessary to give a very little nitrous oxide gas. Patient complained only moderately of pain. Left seminal vesicle and vas deferens were manifestly tuberculous and completely excised. Right vesicle, vas and prostate not attacked. On account of enlargement of testicle and apparent involvement, castration was performed.

Pathological report: Left seminal vesicle, vas deferens, epididymis and testicle all contained areas of tuberculosis which was confirmed by the microscope. Vas 22 cm. long.

May 10, 1920. Patient has had a very satisfactory convalescence, with no urinary leakage. Wound in left scrotum healed per primam. Sutured portion of perineal wound healed per primam. Small perineal sinus discharging a little pus. Patient says urination is distinctly improved since operation; is able to retain urine longer and has no pain.

July 19, 1920. Patient readmitted to hospital complaining of swelling of the right testicle which began ten days after leaving hospital and has been associated with much pain. Patient has had no dysuria, urgency, hematuria, hesitancy or incontinence but voids about every hour. Perineal wound has remained healed but wound in left groin opened a month ago.

Examination: Right side of scrotum has a fairly large hernia, a hydrocele of moderate size, obscuring testicle. Considerable enlargement and induration of the entire epididymis. Rectal: Examination shows prostate of about normal size; an indurated mass about 2 cm. above the prostate in the region between the two seminal vesicles; slight induration along the lateral walls of the pelvis and the region of the left seminal vesicle which has been excised negative; right seminal vesicle apparently not enlarged or abnormal.

Second operation: July 21, 1920. Young; infiltration anesthesia, 1:400 procaine. Castration, right side. Epididymectomy not attempted on account of evident involvement of the testicle. No effort to remove the entire vas or the right seminal vesicle which is apparently negative. Scrotal wound packed with gauze.

Pathological report: Extensive tuberculosis of the epididymis, with numerous small tubercles throughout testis.

Convalescence: Satisfactory, discharged fifteen days after operation with small sinus in the scrotum on each side; perineum closed. General condition excellent.

September 28, 1920. Patient complains of frequency of urination. Cystoscope shows general cystitis, no ulceration. Ureters catheterized; kidney urine is free from infection and both kidneys are of equal function. Bladder urine contains pus cells and numerous cocci. Patient put on irrigations.

January 21, 1921. Urine now shows numerous pus cells and bacilli.

February 11, 1921. Letter: "Operation one year ago. I am improved but have two discharging sinuses, one on the left side of the scrotum and one in the perineum, which discharge freely. Urination is still frequent, about ten times during day and five times at night, but have no pain in bladder or on urination. Sometimes when on my feet have pain radiating to right kidney from bladder but have had no chills, fever nor sweats. Sexual powers had disappeared three years before operation, no erections. My general health is excellent."

Comment: Here, as in cases II and III, both vesicles and ampullæ should have been removed at first operation.

Case XIII. B. N. G. No. 8707. Age twenty-five. Married Admitted April 20, 1920.

Complaint: Prostatic trouble.

Past history: Negative. Denies venereal disease. Sexual powers normal.

Present illness. About three years ago began to have frequency of urination at intervals of about two hours night and day, about the same time had a slight difficulty of urination and pain but has never had retention or hematuria. Two weeks ago began to have swelling in the scrotum but with very little pain, shortly after a discharging sinus formed (patient did not complain particularly of either testicle). Urination has continued to become more frequent and difficult. Patient voids now about every hour night and day and there is considerable pain, hesitancy and dribbling. He has not lost weight and there is no history of pain in the chest or coughing. No pain in the region of either kidney.

Physical examination: Patient is a well developed man and appears healthy. Lungs: Negative with the exception of a few coarse râles. Heart: Negative. Kidneys not palpable nor tender. Genitalia: Penis normal, no urethral discharge. Scrotum, right side: Testicle normal in size and consistence, epididymis considerably enlarged, irregular in the globus minor and body, globus major apparently normal, connected with the lower end of the epididymis is a sinus which

discharges pus. Right vas deferens is enlarged, irregular and nodular. Left side: Testicle normal, epididymis enlarged, irregular and markedly indurated in its entire extent, no areas of fluctuation, no sinus. Vas deferens apparently normal (see diagram).

Rectal: Prostate slightly enlarged, the right lobe is prominent, slightly nodular, markedly indurated but not tender. The left lobe is also slightly irregular, moderately indurated but not enlarged. At the upper end of the prostate on the left side an indurated cord is felt, it extends upward and outward as far as the finger can reach. On the inner side of this another cord is felt, less prominent and less indurated. The outer part of the left vesicle is very slightly indurated and adherent. On the right side there is an irregular mass of induration apparently involving the inner portion of the right vesicle or vas. The outer portion of the right vesicle is apparently not enlarged or indurated (see diagram). A few adhesions are present along the outer side of the prostate and vesicles. Rectum negative. No enlarged glands.

Impression: Tuberculosis of epididymis, vasa deferentia and both lobes of prostate. Seminal vesicles (?) Indication: Radical excision of seminal tract including partial prostatectomy.

Urine: Slightly cloudy, acid reaction; specific gravity 1004. Trace albumen. No sugar or casts, pus in slight amount. Culture: Colon bacillus in moderate amount. Cystoscopy, April 26: Cystoscope enters easily. B. C. 100 cc. Bladder irritable; mucous membrane diffusely red but not ulcerated. Ureteral orifices appear normal. Right ureter: Catheter passes easily up to the kidney. Left ureter: Impossible to introduce the catheter more than a short distance, apparently a stricture present. No reaction around the orifice to suggest tuberculosis of left kidney. Urine from right kidney contains short thick bacilli, no tuberculosis found. Phthalein test: 25 per cent from right kidney in one hour. Collection from bladder for same period 3 per cent, pyelogram of right side taken, apparently normal.

Impression: Pyelitis, right side, slight. Probable tuberculosis of left kidney.

April 29: Additional studies of the bladder urine have demonstrated tubercle bacillus. Second attempt at ureteral catheterization: Right side successful as before. Left side: No. 5 catheter entered 0.5 cm. Urine flowed through this by drops continuously, clear, pale and microscopically negative. Thorium introduced into the left ureter and pyelogram taken, shows urethral dilatation beginning at the Juxtavesical portion of the ureter 1 cm. in diameter in upper portion. Kid-

ney apparently normal in size, pelvis not well filled. Diagnosis indefinite. Garceau catheter introduced into right ureter and function secured, appearance time six minutes, output from right kidney in a half hour 28 per cent, at the expiration of test the bladder was catheterized and washed out, transvesical phthalein (left ureter) 18 per cent.

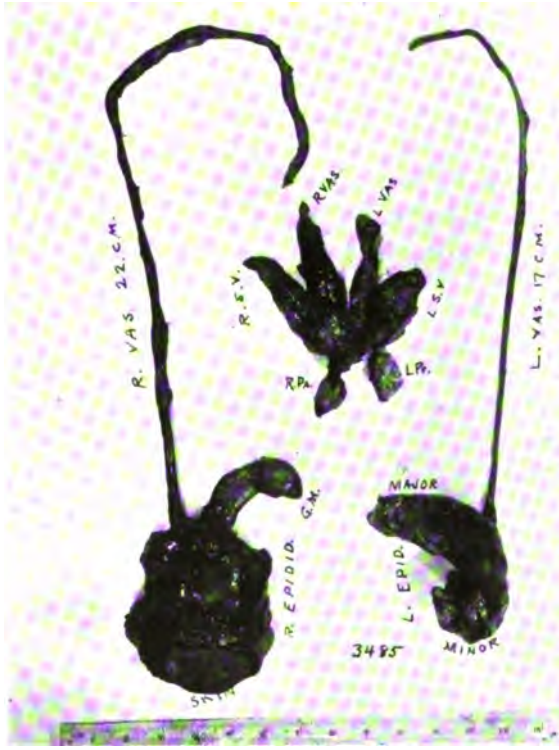

FIG. 31. CASE XIII, No. 8707 B. U. I. SPECIMEN REMOVED AT OPERATION

Impression: Right pyelitis. Stricture of end of left ureter, dilatation above. Left kidney impaired, tuberculosis not proved but suspected.

April 30, 1920. Operation: Young. Nitrous-oxide, oxygen-ether. Radical excision of seminal tract for tuberculosis (fig. 31). (1) Perineal operation: Excision of both seminal vesicles, both ampullae and

portion of each lobe of the prostate. Ejaculatory ducts, urethra and bladder not injured. (2) Excision of right epididymis with tissue surrounding the sinus of skin of scrotum and removal of entire vas deferens by traction through scrotum. (3) Removal of entire left epididymis and almost all of the left vas deferens.

Remarks: The operation was carried out without difficulty. The deeper portion of the left vas deferens back of the bladder was not removed (vas broke at that point when traction was made, see photograph). Perineal and scrotal wounds closed partially, small gauze packs.

Pathological report: Left epididymis markedly tuberculous. Left vas negative. Left seminal vesicle hard and nodular, right seminal vesicle the same as left. Right vas indurated, nodular, tuberculous. Right epididymis: Extensive tuberculosis involving the portion of testicle which was removed.

Convalescence: Uneventful. Packs removed on third and fourth days, discharged on seventeenth day. Small perineal sinus discharging pus, no urinary leakage. Patient has gained in strength, urinations have improved greatly, interval now four hours. Urine contains pus and bacilli. General condition excellent.

June 22, 1920. Urine still cloudy, contains pus and bacilli. Impossible to catheterize the left ureter. Phthalein from right side 28 per cent, transvesical 5 per cent in one-half hour. July 7, cystoscopy: Successful catheterization of both ureters with No. 7 catheters. Urine from left side cloudy and contained tubercle bacilli, urine from right side slightly cloudy, no bacteria. Phthaleins equal.

Impression. Tuberculosis of left kidney and ureter.

Genitalia: Small suppurative sinus on the right side of scrotum, testes normal. Epididymes and vasa deferentia absent. Rectal: Prostate slightly irregular, indurated and adherent, much smaller than before operation, very slight induration in the region of the seminal vesicles which are absent, no abscess. Small perineal sinus.

July 11. Re-admitted to the hospital for nephrectomy. Thorax and abdomen negative. Left kidney not palpable nor tender.

July 12, 1920. Operation: Frontz. Gas and ether. Left nephrectomy for tuberculosis. Curved muscle cutting incision in left loin. Ureter brought up, injected with pure carbolic, divided and ligated with chromicized catgut. Kidney about usual size and shape, not opened. Pedicle ligated with chromicized catgut, kidney removed without difficulty. Wound closed, two gauze packs, chromicized

catgut for muscle and continuous black silk for the skin. Cigarette drains at upper angle of wound. Condition excellent.

Pathological report: Tuberculosis involving the lower portion of the pelvis and the middle portion of the cortex and medulla. Considerable normal tissue present.

Convalescence: Uneventful. Discharged August 11, 1920, one month after operation. Wound healed except for a small sinus at the upper angle discharging pus. Small perineal sinus. No urinary or rectal connection. General condition much improved.

January 20, 1921. Patient states that recently urination has become more frequent. Small sinus still persists in the site of kidney operation. Urine is cloudy and contains pus cells and bacilli but no tubercle bacilli are found. General health excellent. Has had no fever. Cystoscopy: Bladder irritable. Residual urine, 75 cc. Prostatic orifice normal. Left ureteral orifice is seen as a small depressed area, no ulceration. Right ureteral orifice normal, catheter introduced into right kidney easily. Urine from right side shows pus and colon bacilli but no tuberculosis. Phthalein, intramuscular, first half hour 40 per cent, second half hour 20 per cent. Patient to have irrigations and instillations.

February 19, 1921. Patient has been under treatment by hydraulic distension and instillation of 220. His symptoms have improved greatly. Bladder capacity 125 cc. No recurrence of genital tuberculosis. Patient is discharged.

Case XIV. B. A. R. No. 8729. Age thirty. Married. Admitted April 24, 1920.

Complaint: Swelling of the right testicle and pains in the back, hips, legs and buttocks.

Past history: Gonorrhea two and a half years ago, lasted four months, no complications.

Present illness: Two years ago while riding a horse, lost his footing and badly bruised his right testicle against the saddle. For several days after this patient had considerable pain in the testicle and pain in the glands of the groin for two months. Later he was kicked in the back by a horse. Since then has had rheumatism and arthritis involving left thigh and leg.

On admission, patient complained of rheumatism which extended down the back of the left leg, along the outside, to the foot and toes. Patient had practically no pain in the testicle, epididymis or groin. Urination free, painless; intervals slightly increased 1 to 2 at night,

6 to 7 times during the day. Sexual powers normal. Intercourse about 5 times a week. Ejaculations normal, no blood. Has lost 14 pounds in weight during the past two months. Has had no cough and examination of the chest was negative. X-rays of the spine have been negative. Wassermann negative. On account of the pain, above described, has taken codein ½ grain daily for ten months. Patient unable to walk.

Examination: Thorax: The lungs show a few fine râles at the left apex, posteriorly and slight dullness; diminished breath sounds and harsh breathing in both inter-scapular regions; gives one the impression of fibrosis. Heart negative. Abdomen negative. Kidneys negative. Genitalia: Penis negative. Left testicle, epididymis, cord and groin negative. Right testicle normal size but rotated. Epididymis considerably enlarged, very hard, irregular, nodular throughout its entire extent. No fluctuation and no sinuses. Right vas deferens hard, nodular and enlarged. Rectal: Prostate is broader than normal, median furrow and notch wide and deep, right lobe prominent, globular, slightly irregular, moderately indurated particularly at the upper end and externally. Running upward and outward from the prostate are adhesions. Left lobe of the prostate is similar to the right with adhesions running upward and outward. Right seminal vesicle is soft, indistinct, apparently not enlarged or indurated. The left seminal vesicle is also apparently not enlarged or indurated. Neither vas deferens is palpable. Urine: Clear, acid in reaction, specific gravity 1018, no albumen, no sugar, no casts. Microscopically shows pus in small amount; no bacteria seen; tuberculosis sought for. Phthalein test; appeared in ten minutes, 60 per cent for the first hour and 20 per cent for the second; total 80 per cent. X-rays of the chest, kidneys, bladder, hips taken. Outlines of kidneys plainly seen, apparently negative. Vertebrae negative. Chest shows fibrosis of both upper lobes. Hips negative.

Impression: Tuberculosis of right epididymis and prostate, probably of seminal vesicles and vasa deferentia. Radical operation advised.

May 7, 1920. Operation: Young. Gas and ether. Radical operation: (1) Perineal excision of both lobes of the prostate, right seminal vesicle, ampula of right vas deferens. Urethra and bladder not opened. (2) Epididymectomy, right side, complete removal of vas deferens by traction, through scrotal wound. Testicle normal; small area removed, rest left intact. Both wounds drained. Both lobes of the prostate were found to be very hard and considerably enlarged. Right vas

and right seminal vesicle were hard, irregular and yellowish material was seen shining through the fibrous cavity. Vas was divided about 7 cm. above the prostate. Prostate and seminal vesicles were evidently tuberculous.

Pathological report: Extensive tuberculosis of vesicle, vas, both lobes of prostate and right epididymis.

May 22, 1920. Operation two weeks ago; no complications. No urethral leakage. Testicular wound healed per priman. Perineal wound healing by granulations. Patient much improved in health and is now able to walk, whereas before operation was unable to do so. Patient discharged. General condition excellent.

June 22, 1920. Patient reports that he was operated on two weeks ago for acute mastoiditis, considerable pus evacuated. Still suffers from rheumatism. Result of genital operation excellent.

March 5, 1921. Letter: "My condition is improved and I do not suffer so severely. My back is rigid and I can use my left leg but little without the aid of crutches. [Before operation could not walk at all.] I have three places discharging pus, viz., from my ear, from the cartilage where the ribs join on my breast and from my left foot; the breast was lanced about eight months ago and the foot about two months ago."

Case XV. N. D. No. 5430 B. U. I. Age thirty-three. Widower. Admitted December 2, 1920.

Complaint: Swollen, painful left testicle and pain in groin, painful defecation.

Note of previous history: In 1911, at age of twenty-four, had gonorrhea complicated by left epididymitis from which he apparently recovered. Several months later he suddenly had swelling and pain in right testicle. After that he suffered off and on with pain in both testicles. Four years ago (age twenty-nine), began to have pain in bladder, frequent and painful urination. He was admitted to this hospital October 7, 1916, complaining of pain in right hypochondrium. Cystoscopy, ureteral catheterization and pyelograms were carried out—all negative. Careful search for tuberculosis made but none found. Diagnosis, pyelitis. Discharged October 26, 1916.

Readmitted December 8, 1916, again complaining of pain in right side. Tubercle bacilli found in urine from right kidney.

Operation: Right nephrectomy January 8, 1917. Convalescence uneventful. Pathological examination, tuberculosis of right kidney. Discharged February 8, 1917.

In May, 1917, after an injury to right testicle, an abscess formed and was opened by operation.

Patient admitted again July 7, 1917, complaining of frequent and painful urination. Examination showed right tubercular epididymitis with fistula. Right epididymectomy was performed. Microscopic diagnosis, tuberculosis. Discharged much improved, August 3, 1917.

August, 1920, developed swelling and pain in left testicle and epididymis which has persisted up to the present time.

Examination: Patient is thin. Chest: Breath sounds are harsh all over chest especially both apices. No râles elicited. Heart negative. Abdomen: Scar on right side from previous nephrectomy. Left kidney apparently negative. Genitalia: Penis negative. Right epididymis absent. Right testicle apparently normal. No sinus. Left testicle normal, slight hydrocele. Left epididymis greatly enlarged throughout entire epididymis, very hard, no areas of fluctuation, no sinus. Vas nodular and indurated. Rectal: Prostate indurated on each side, soft in the middle, not enlarged. Induration also runs across upper edge of prostate and continues upward involving both seminal vesicles and tissues between them. This induration is considerable and obscures seminal vesicles and vasa deferentia, extending at least 4 cm. above the prostate. Urinalysis: Slightly cloudy, acid 1004, pus cells few. Microscopically: Bacilli, no tubercles. Phthalein test: Appearance time fifteen minutes; first hour 45 per cent, second hour 10 per cent.

October 25, 1920. Operation: Frontz. Gas, oxygen and ether. Radical operation. Excision, through perineum, of both seminal vesicles and ampullae and portion of each lateral lobe of prostate, without injury of bladder, urethra or rectum. Removal, through scrotal incision, of left epididymis and vas deferens, which was removed completely by traction through wound. Testicle not involved, not removed. Mediastinum testis invaded. Both wounds closed with drainage.

Pathological report: Epididymis, both seminal vesicles, ampullae and portions of prostate removed, show extensive tuberculosis.

Convalescence: On October 29, sudden fever (103°) and pain in left side. Diagnosis, pyelitis. Under forced "fluids" temperature finally became normal and on discharge, December 2, patient was in excellent condition, wound healed. Voiding urine at intervals of every two hours without pain. General health much improved.

February 16, 1921. Letter from physician: "Patient voids twice at night and three times during day. Urine clear macroscopically.

The left side of scrotum contains a hard nodule at the seat of the operation. He now complains of some stomach trouble, but on the whole for a man who has tuberculosis of the urinary tract, he is in very good condition."

VI. AN ANALYSIS OF THE FIFTEEN RADICAL OPERATIONS ABOVE DESCRIBED

The 15 radical operations which have been printed in extenso above have been studied by analytical tables, and in order that our readers may get a better comprehension of the operative results and the pathology these tables are reproduced here.

Comment. The previous histories and the above table have given such a complete idea of the cases on which this radical operation has been carried out that hardly any additional comment seems necessary.

a. Discussion of pathology and technique

The tissues removed at operation were as follows: Right seminal vesicle 10 (alone 2); left seminal vesicle 13 (alone 5), bilateral 8. Unilateral 7. Of these 7 unilateral excisions of the seminal vesicles and ampullæ 3 subsequently developed tuberculosis of the remaining epididymis on that side, the other epididymis having been excised with its corresponding ampulla and vesicle at operation. This would seem to be an argument for routine double vesiculectomy.

In all cases the seminal vesicles removed were thought to be involved, but not proven in 1 case.

The ampullæ were removed as follows: right 10, left 13, both 8. (Same as with vesicles, above).

The vasa deferentia were removed completely as possible with the epididymis and in all but about 3 cases the vas came away completely, often showing the teeth of clamp on lower end. In one case, in which the vas did not come away completely there was present an extensive retrovesical tuberculosis which involved the vasa deferentia case VII.

TABLE 1

Results of fifteen radical operations for tuberculosis of seminal tract

CASE NUMBER	B. U. I. NUMBER	AGE	LUNG TUBERCULOSIS BEFORE OPERATION	TUBERCULOSIS OF KIDNEY	PERINEAL WOUND CLOSED	INTERVAL BETWEEN OPERATION AND LAST REPORT	POST OPERATIVE TUBERCULOSIS OF OTHER ORGANS	GENERAL HEALTH AT PRESENT	FINAL OPERATIVE RESULT
1	3515	28	None	Tb. bacilli from right kidney before operation	5½ weeks	7 years	None	Excellent; slight pyuria; cause undetermined; coitus normal	Excellent local result; no sinus or fistula; micturition normal
2	4159	42	Old lung tuberculosis	None	Small fistula	Lived one year after radical operation	Lung tuberculosis before operation; abscess of chest-wall, shoulder, epididymis, mediastinum later	Developed tuberculosis mediastinum, chest wall, right shoulder; died 1 year later	Persistent urinary fistula; opposite epididymis involvement 1 year later
3	3632	22	Old lung tuberculosis	None	3 weeks	2 years, 7-8-16	Returned with tuberculosis other epididymis 2 years later; epididymectomy 6-30-16	General health excellent, 7-8-16; letters not answered and not returned	Involvement other epididymis; cured by operation; condition otherwise excellent; no perineal fistula; urination normal

4	4322		None	None	5 weeks	Not heard from; letters not returned	None; patient refuses to answer letters	Condition good on discharge 6 weeks after operation; wound not healed, fistula present before operation	No report since leaving hospital condition good then
5	4330	30	None	None	Small fistula still open	6 years	None	Good; micturition normal; interval 3 hours	Excellent local result; second epididymis not involved; small urinary fistula persists
6	4980	34	None	None	Sinus still open; not urinary	5 years	None	Excellent; sexual powers normal; urination normal	Excellent result; small perineal sinus; no urinary fistula
7	7933	27	Old lung tuberculosis; suspicious fibroid tuberculosis	Left nephrectomy 4 months previous	5 weeks	14 months	None since operation; previous kidney and bladder; tuberculosis, nephrectomy	Condition much improved; urination frequent but much improved; coitus normal	Excellent result; perineal sinus, not urinary

TABLE 1—*Continued*

CASE NUMBER	B. U. I. NUMBER	AGE	LUNG TUBERCULOSIS BEFORE OPERATION	TUBERCULOSIS OF KIDNEY	PERINEAL WOUND CLOSED	INTERVAL BETWEEN OPERATION AND LAST REPORT	POST OPERATIVE TUBERCULOSIS OF OTHER ORGANS	GENERAL HEALTH AT PRESENT	FINAL OPERATIVE RESULT
8	8486	51	None	None	4 weeks	1 year	None	Excellent; sexual powers satisfactory	Excellent local result; no sinus or fistula
9	8525	19	History of empyema; probable lung tuberculosis	None	3½ weeks	1 year	None (no flare up of old empyema or lung tuberculosis	Good; no urinary complaint; sexual powers satisfactory	Excellent local result; no fistula; no sinus
10	8561	43	Suspicious fibroid tuberculosis	Pus and tb. in urine right kidney	Sinus still open; not urinary	1 year	None (no flare up of old suspected lung tuberculosis)	Excellent; much improved; micturition better; impotent before operation	Local result excellent; small sinus in scrotum; no fistula
11	8681	23	None	None	3 weeks	1 year	None	Excellent; sexual powers normal; micturition normal	Excellent local result; two small sinuses; no urinary fistula
12	8712	48	Chronic tuberculosis of lungs; state sanatorium	None	2 months	11 months	Old tuberculosis of lungs; condition still quiescent	Good; much improved; still has cystitis and frequency	No local recurrence; two discharging sinuses; no urinary fistula

13	8707	25	None	Present before; left nephrectomy 3 months later	2 weeks	10 months	Tuberculosis of left kidney, present before, removed 3 months later	Improved but still suffers with pyelitis	Good local result; no urinary fistula; small sinus; cystitis
14	8729	30	Suspicious fibroid tuberculosis; arthritis (tuberculosis?) of spine, etc.	None	2 weeks	11 months	General arthritis before; involvement of rib, mastoid and foot since operation	Improved; now able to walk	Excellent local result; no fistula; urination good
15	5430	30	None	Right nephrectomy 3 years previous	3 weeks	3 months	None	Good	Excellent local result; no fistula; urination normal

Tabulation. Number of cases, 15. Lung tuberculosis present or suspected before operation, 7. Kidney tuberculosis before operation, 5. (Nephrectomy, 3.) Operative result excellent in all cases. Operative mortality, 0. One death, lung tuberculosis, one year later. Not heard from, 1. Perineal urinary fistula, 1. Persistent discharging sinus, 7. Sexual powers normal, 5. Impaired by operation, 0. Not noted in reply, 10. Operative failures, 0.

TABLE 2

Abstract of pathological report seminal vesicles, prostate, etc.

CASE NUMBER	B. U. I. PATHOLOGICAL NUMBER	SEMINAL VESICLES		PROSTATE		VASA DEFERENTIA		AMPULLAE	
		Right	Left	Right lobe	Left lobe	Right	Left	Right	Left
1	1780	Not removed	Many small and conglomerate tubercles	No evidence of tuberculosis	No evidence of tuberculosis	Not removed	Calibre diminished at upper end; many caseous tubercles at lower end	Not removed	Tuberculosis
2	1742	Not removed	Many small tuberculous cavities	Not removed	Extensive caseous tuberculosis	Not removed	Diffuse tubercular process, attachment to Globus Minor	Not removed	Tuberculosis
3	1841	Indurated, nodular, caseous tubercles	Not removed	Fibrosis and a few small tubercles	No evidence of tuberculosis	Large nodule of caseous tuberculosis near ampullae	Not removed	Tuberculosis	Not removed

4	2059	Caseous tuberculosis; much scar tissue	Scar tissue throughout; no evidence of tuberculosis	No definite evidence of tuberculosis; scar tissue	No evidence of tuberculosis	Many caseous tubercles	Fibrous throughout; no evidence of tuberculosis	Tuberculosis	Much scarred; no evidence of tuberculosis
5	2064	Much enlarged; dense scar tissue; many caseous tubercles	Enlarged; small and large tuberculous abscesses	Somewhat fibroid; tuberculosis?	Much fibrosis; many caseous tubercles	Irregularities externally; caseous tubercles present	Nodular; tuberculosis present	Tuberculosis?	Tuberculosis
6	2363	Not removed	Small tubercles; much fibrosis	Not removed	Caseous tubercles	Not removed	Tuberculosis; mostly at lower end	Not removed	Tuberculosis
7	3344	Fibrous; small tubercles	Many caseous areas of tuberculosis	Not removed	Not removed	Uniform; no evidence of tuberculosis	Fusiform thickenings caseous areas of tuberculosis	Tuberculosis	Tuberculosis
8	3365	Hard; nodular; irregular; tuberculosis	Hard; nodular; irregular; tuberculosis	Fibrosis; tuberculosis	Fibrosis; tuberculosis	Uniform throughout densely inflammatory; tuberculosis	Uniform throughout densely inflammatory; tuberculosis	Tuberculosis	Tuberculosis

TABLE 2—*Concluded*

CASE NUMBER	B. U. I. PATHOLOGICAL NUMBER	SEMINAL VESICLES		PROSTATE		VASA DEFERENTIA		AMPULLAE	
		Right	Left	Right lobe	Left lobe	Right	Left	Right	Left
9	3390	Somewhat enlarged; many tiny tubercles	Somewhat enlarged; many tiny tubercles	No evidence of tuberculosis	No evidence of tuberculosis	Not removed	Small, uniform in calibre; no evidence of tuberculosis	Tuberculosis	Tuberculosis
10	3430	Enlarged; fibrous; irregular; many tubercles	Enlarged; marked fibrosis; few tubercles	Few small tubercles	Few small tubercles	Few tubercles at each end	Thickening and few tubercles near epididymis	Tuberculosis	Tuberculosis
11	3471	Not removed	Firm; indurated; few tubercles	Not removed	Not removed	Not removed	Thickened; some nodules near ampullae; tuberculosis?	Not removed	Tuberculosis?
12	3482	Not removed	Enlarged; caseous tuberculosis	Not removed	Not removed	Not removed	3 nodules, upper, middle and extreme lower, contain tubercles	Not removed	Tuberculosis

13	3485	Enlarged, firm indurated; caseous tubercles	Enlarged, hard, nodular; caseous tubercles	Portion, tuberculosis	Portion; tuberculosis	Nodules of caseous tuberculosis in lower portion	No evidence of tuberculosis; uniform	Tuberculosis	Tuberculosis?
14	3493	Tuberculosis	Not removed	Tuberculosis	Tuberculosis	Thickened throughout; lower portion tuberculosis	Not removed	Tuberculosis	Not removed
15	3667	Small, fibrous tuberculosis	Much enlarged; caseous tubercles	Firm, fibrous; tubercles, caseation	Firm, indurated; tuberculosis	Lower portion removed; no evidence of tuberculosis	Uniform in calibre; no evidence of tuberculosis	Tuberculosis?	Tuberculosis

Résumé

Removed	10	13	10	12	9	13	10	13
Involve	10	12	5	9	7	8	8	10
Uninvolved	0	0	2	4	2	4	0	1
Doubtful		1	3	0	8	1	2	2
Not removed	5	2	5	3	6	2	5	2

Bilateral vesiculectomy 8. Unilateral vesiculectomy 7 (right 2, left 5). In 3 of these cases subsequently remaining epididymis was attacked.

Abstract, Pathological report of tissue

CASE NUMBER	LEFT EPIDIDYMIS				
	As a whole	Globus minor	Body	Globus major	As a whole
1	Enlarged; tuberculosis	Conglomerate caseous tubercles	Caseous tubercles and small abscess	Destroyed by conglomerate caseous tubercles	Not removed
2	Enormously enlarged; measures 3 inches in length; many tubercles	Greatly thickened; tuberculosis	Tuberculosis	Tuberculosis	Not removed at first, removed later diffusely fibroid t.b. throughout
3	Enlarged; tuberculosis when removed 2 years later				Enormously enlarged; conglomerate caseous tubercles
4	Tuberculosis	Caseous tubercles; sinus to skin	Apparently normal	Apparently normal	Sinus present tuberculosis
5	Removed one year preceding at another hospital				Enlarged; tuberculosis
6	Tuberculosis	Caseous tuberculosis	Caseous tuberculosis	Tuberculosis; least involved of any portion	Not removed
7	Tuberculosis	Conglomerate caseous tubercles	Apparently normal	Apparently normal	Many large caseous conglomerate tubercles
8	Tuberculosis	Fibrous tuberculosis	Fibrous tuberculosis	Tubercles	Tuberculosis, very extensive

moved; epididymes, testicles and kidneys

RIGHT EPIDIDYMIS			TESTICLE		TUBERCULOSIS OF KIDNEY
Globus minor	Body	Globus major	Left	Right	
Not removed	Not removed	Not removed	Not removed	Not removed	Tb. bacilli from right kidney before operation (once) but no further symptoms
emoved later, t.b.	Removed later, t.b.	Removed later, t.b.	Enlarged; surrounded by hydrocele; tubercles in part adjacent to epididymis	Not removed	None
aseous tubercles	Caseous tubercles	Caseous tubercles	Not removed	Tuberculosis involvement of part adjacent to epididymis	None
arge tuberculous abscess involving testicle and skin	Fibrous; tubercles in upper part	Extensively involved in tubercular process	Not removed	Tuberculous abscess in lower pole; remainder normal	None
arge tubercular abscess; fistula opening externally	Caseous tubercles	Enlarged, hard and indurated. Caseous in portions	Not removed	Normal	None
ot removed	Not removed	Not removed	Not removed	Not removed	None
uberculosis	Tuberculosis	Tuberculosis	Normal	Small portion removed shows caseous tuberculosis	Left nephrectomy 4 months previously; tuberculosis
uberculosis; fibrosis	Extensive caseation; tuberculosis	Large conglomerate tubercles	Small part of upper part of testes excised, t.b.	Small part of upper part of testes excised, t.b.	None

CASE NUMBER	LEFT EPIDIDYMIS				
	As a whole	Globus minor	Body	Globus major	As a whole
9	Tuberculosis	Enlarged; conglomerate tubercles	Enlarged; tuberculosis	Enlarged; tuberculosis	Removed previously with testicle; tuberculosis probable
10	Enlarged; irregular; caseous tuberculosis	Extensive induration; tuberculosis	Tuberculosis	Caseous tuberculosis	Enlarged tuberculosis
11	Marked enlarged; tuberculosis; subcutaneous abscesses	Tubercles	Tubercles	Tubercles	Not removed
12	Tuberculosis	Caseous tubercles	Tubercles	Tubercles	Removed later; tuberculosis
13	Enlarged; tuberculosis	Firm, hard and indurated; tubercles	Caseous tubercles	Enlarged; conglomerate caseous tubercles	Tuberculosis
14	Not removed	Not removed	Not removed	Not removed	Enlarged; tuberculosis
15	Greatly enlarged; tuberculosis	Hard and firm. Nodular; tuberculosis	Enlarged; caseous tubercles	Much enlarged; caseous tubercles	Not removed
Résumé					
Involved....	13	13	11	11	11
Uninvolved.	0	0	2	2	0
Doubtful....	0	0	0	0	0
Not removed	2	2	2	2	4

Bilateral excision of epididymis or testicle 10 (3 being subsequent operations in cases

Continued

RIGHT EPIDIDYMIS			TESTICLE		TUBERCULOSIS OF KIDNEY
Globus minor	Body	Globus major	Left	Right	
Removed previously; tb. probable	Removed previously; tb. probable	Removed previously; tb. probable	Not removed	Removed previously elsewhere; tuberculosis probable	None
Tubercles	Tubercles	Tubercles	Early caseous tubercles present in portion adjacent to epididymis	Not removed	Pus and tb. right kidney; process slight
Not removed	Not removed	Not removed	Not removed	Not removed	None
Removed later; tuberculosis	Removed later; tuberculosis	Removed later; tuberlosis	Very edematous; few early tubercles	Testicle removed 3 months later; tuberculosis	None
Conglomerate caseous tubercles	Conglomerate caseous tubercles	Conglomerate caseous tubercles	Not removed	Portion removed; fibrous and caseous tuberculosis	Left nephrectomy 3 months later; tuberculosis
Few tubercles	Caseous tubercles	Caseous tubercles	Not removed	Not removed	None
					Right nephrectomy 3 years previous; tuberculosis
11	11	11	4 (1 partly excised)	7 (3 partly excised)	5 (3 removed)
0	0	0	0	0	10
0	0	0	0	0	Removed
4	4	4	12 (1 partly)	11 (3 partly)	

which corresponding ampulla and vesicle had not been excised).

Other similar, but less extensive cases have been seen. Before clamping and dividing the vas it is well to free it as high up as possible back of the bladder, remembering to avoid the ureter and peritoneum.

Both lateral lobes of the prostate have been removed in 10 cases and the left lobe alone in 3 of the other five cases. In 2 cases the excised prostatic tissue was found to be not tuberculous on either side. The urethra was not opened in any case by the excision of the lateral lobes, and the fact that only one of the patients has a urinary fistula shows that it is a safe procedure. The severe tuberculous involvements which have been encountered in many cases show the advisability of prostatic resection.

The deeper portion of the vas deferens—the ampulla—was apparently involved in all specimens except one. On the right side 10 ampullæ were removed, 8 positively tuberculous, and in 2 probably so (sections not proven microscopically). On the left side, 13 removed, 10 positive, 2 probable, only 1 positively not tuberculous. In many instances the tuberculous ampulla formed a larger mass than the adjacent vesicle.

The remainder of the vas deferens which was extracted by traction through the groin contained no definite areas of or nodules of tuberculosis in 6 out of 22 vasa removed. The upper and lower ends were the portions most frequently involved, and in several cases were associated with exclusive perivasal tuberculosis of the retrovesical tissues. Our findings surely prove that forcible evulsion of the vas from groin, without removal of ampulla and vesicle through perineum is a very dangerous procedure and bad practice. As a rule no difficulty is experienced in extracting the entire vas deferens from a wound in the upper part of the scrotum, by the two-and-fro traction, with the assistance of a clamp in the perineal wound, as described in technique of operation. It is useless and harmful to open up the inguinal canal, and especially so, to follow the vas into the pelvis as in the Villeneuve technique or the modification practiced by Whiteside, who has admitted, in his more recent papers the bad results obtained by Villeneuve's inguinal method.

The epididymes were removed 24 times, 13 left, 11 right. All were definitely tuberculosis, but in two cases on the left side the globus minor alone was involved. In the other 22 epididymes the entire epididymis was tuberculous. No case of isolated globus major tuberculosis was found—interesting fact as regards etiology.

Eight complete castrations were performed (3 left, 5 right. Only in one case were both testicles removed). In four instances excision of the upper posterior part of the testicle next to the epididymis was carried out, and tissues excised found to be tuberculous. None of these cases have required complete castration although all have gone more than a year. Of the 8 testes removed all but 2 show only a limited area of involvement in that portion of the testis near the globus major of the epididymis. Only 1 presented extensive caseation of the entire testicle. In only one case was double castration carried out and in this case, lung tuberculosis was present and operation was done quickly under novocain (case XII).

These cases therefore show the comparative rarity of involvement of the testis, and that in most cases a partial excision is sufficient to remove the entire tuberculous area. This should always be attempted in bilateral involvement of the testis. In our one such case the bad condition of patient, and wish to avoid a long operation (epididymectomy) under local anæsthesia caused us to do double castration (case 12).

Nephrectomy was performed 3 times (kidneys removed being all markedly tuberculous, two cases operated before radical operation on seminal tract, one after). In one case tuberculosis was found by ureter catheterization of right, kidney; patient maintains health and strength, involvement probably small and quiescent (case 1). Another patient (case X) had a tuberculous right kidney which has remained quiescent.

The lungs were considered involved in 7 cases, all but one apparently quiescent, and 6 have done well since operation; the other case (No. 2) resulted in death from mediastinal tuberculosis one year later. Whiteside counsels against operation in cases with lung involvement. This is certainly true if the

lung involvement is active and extensive. When pulmonary cases become quiescent, however, I agree with Kocher that the genital tuberculosis should be removed and go further than Kocher in advising excision of the seminal vesicles as well as the epididymes or testes. The radical operation can be done under procain infiltration anæsthesia (1 to 400) with only a whiff of nitrous oxide gas occasionally to quiet the patient or it can be done under spinal, or posterior nerve root anæsthesia. In reality nearly all not hopeless cases should be given the chance to get well. Whiteside has shown that desperate cases may sometimes be cured by vesiculectomy.

To reiterate, the pathological study of these 15 cases shows conclusively the preponderant importance of the seminal vesicles as the primary seat of the disease, and the urgency to remove them if radical cures are to be uniformly expected, and the present disgraceful mortality in genital tuberculosis is to cease.

b. Immediate and remote results of these radical operations

The operation has not been reserved entirely for patients in good general condition as shown by the fact that 7 patients had fairly definite evidence of tuberculosis of the lungs previous to operation and 5 patients had tuberculosis of the kidney, 3 requiring nephrectomy. Regardless of this fact, there has been only one death so far recorded, going back as far as 7 years and all but 1 of the cases having been followed almost a year at least. Perineal urinary fistula, that supposed great bugbear of operations upon the tuberculous prostate and vesicles, is present in only 1 case and in this only a few drops of urine escape during urination, so that the condition is not serious. Discharging sinuses are present either in the scrotum, groin or perineal wound in 6 cases. Most of these are recent cases and statistics show that they usually cease spontaneously with time. At any rate, they are not really annoying and compare favorably with statistics following epididymectomy or castration in which a much higher percentage of and more annoying discharging sinuses are recorded in the literature. Another most interesting

demonstration is the fact that the sexual powers are not usually impaired in any way except that the amount of ejaculatory fluid is much lessened. We have no direct evidence that any case has been impaired, though 10 patients have not answered this question either before or after operation. Other operators, however, have shown that the removal of both seminal vesicles and vasa does not impair the sexual appetite or act. In 3 cases (II, III, XII) in which vas, vesicle and epididymis on one side only were removed, the opposite epididymis became involved in the course of a year and required removal and one patient died after the second operation (epididymectomy one year later). Bilateral vesiculectomy was carried out in 8 cases and bilateral epididymectomy or castration in 8 cases, in 3 cases above referred to the second operation being performed later. [in these cases bilateral seminal vesiculectomy should have been done]. It may be found with time that it is wise always to remove both vesicles and ampullæ and, if this is not done, either to ligate and divide the supposed healthy vas, which is not removed, or to remove the ampulla on that side, or to ligate the vas through an incision in the scrotum so as to avoid involvement of the second epididymis.

There has been one death, and that one year after the radical operation. On first admission of this patient (No. II) râles were present in lungs, and shortly after fever night sweats and abscess of chest wall developed. Only one seminal vesicle was removed and the remaining epididymis developed tuberculosis which was excised one year later, death from extensive tuberculosis of lungs, mediastinum, chest wall and shoulder occurred several months later. Removal of both seminal vesicles when first operation was done would probably have prevented involvement of remaining epididymis, and possibly have given patient a chance to recover from the lung tuberculosis. This case (II) and two others (III and XII) furnish excellent arguments for always excising both vesicles and both ampullæ at every radical operation—especially as their excision does not destroy the sexual powers.

Two patients refuse to answer letters and questionnaires, which are not returned indicating that the patients are still alive (cases III and IV). I believe the results obtained in both of these cases were good.

Of the 12 cases in which the ultimate results have been obtained up to date, the radical operation has been eminently successful in improving the general health (even in case 14 with previous generalized tuberculous arthritis). One of these cases has developed tuberculosis in the remaining epididymis and required epididymectomy. In all cases there has been ultimately an excellent local result, with improvement in micturition even in those cases with tuberculosis of the bladder and kidney (3 of which were removed).

Considered therefore from every standpoint the results obtained by the radical operation in these 15 cases have been eminently satisfactory and far better than we have obtained by mere excision of the epididymis or testicle.

VII. DISCUSSION OF RADICAL OPERATIVE TECHNIQUE

In my paper upon this same subject in 1901 (21) the various operations for the excision of the seminal vesicles were classified as follows:

1. Perineal method of Zuckerkandl by Ullmann 1889
   Perineal method of Roux 1891
   Perineal method of von Dittel by Schede 1893
   Perineal method of Guelliot 1895
   Perineal method of Baudet 1898
2. Sacral method of Kraske by Schede 1895
   Sacral method of Rydygier by Schede 1895
3. Inguinal method of Villeneuve 1891
4. Suprapubic, rectovesical, extraperitoneal method of Young (20). 1900

At that time 34 cases were to be found in the literature in which operations for tuberculosis of the seminal vesicles associated with testicular disease had been operated upon radically by one of the methods above indicated. The summary of the tissues removed was as follows:

Part removed: One testicle (or epididymis) 23 times, both testicles 5, one seminal vesicle 23, both seminal vesicles 11, portion of prostate 5.

Immediate results: Good, no fistula 13, fistula but otherwise good result 14, in bad condition 2, not mentioned 3.

Ultimate results: Twenty cases, 5 deaths, 10 well, 4 recurrences. Only 8 cases were followed over one year; of these 2 died of pulmonary tuberculosis and 4 were cured.

Writing in 1906, Baudet and Kendirdjy (8) in a most extensive article detail at length the cases which are to be found in the literature and discuss the methods of operation, from which I will extract liberally. There are two methods, the upper route and the lower route. The lower route comprises median perineotomy; ischio-rectal perineotomy; the sacral method and the para-sacral method. The upper route comprises the inguinal; the lateral laparotomy and the median extra-peritoneal laparotomy. The inguinal is suitable only for one vesicle, if you wish to operate upon two vesicles it is necessary to do two operations. The same applies to the lateral subperitoneal laparotomy. The median extra-peritoneal laparotomy, which was described by the author and carried out in three cases, has since been abandoned on account of defective drainage and resultant severe infections.

The perineal method is unquestionably the method of choice and it will be interesting to examine into the various techniques which have been followed.

The first operation was that of Ullmann of Vienna in 1899 (9). Ullmann's case was operated on in two stages—unilateral castration was carried out on the right side in June 1889 and a month later the seminal vesicles were removed by the semilunar perineal incision with the assistance of the finger in the rectum. After sectioning the facia and the levator ani muscles the prostate was completely exposed, and then by introducing a metal sound into the bladder the posterior wall of the bladder was made prominent by pressure. By this maneuver, the vasa and vesicles were easily removed. The vas deferens between the ampulla and groin was not extirpated, but a portion of the prostate which was tuberculous was excised.

Method of Roux (8). Roux performed his first operation in March 1890 and subsequently two other cases. His procedure consisted of castration with high division of the vas and then extirpation from below of the seminal vesicle which was made to appear in the upper portion of the wound by the pressure of the finger in the rectum, with the patient lying on his side—the incision extending in a curve across the perineum backward to one side of rectum. With the use of a traction ligature, the vesicle was drawn further down, separated, and with the stump of the vas deferens was divided close to the neck of the bladder. The remainder of the vas deferens, i.e., up to the inguinal canal where previously divided, was then removed with the seminal vesicle.

Weir in New York was the third to perform seminal vesiculectomy in 1892 (10). Weir carried the scrotal incision up into the groin and opened the inguinal canal, where he freed the vas as high up as possible on the right side, making a tear into the peritoneum in so doing. Then, leaving the testicle free and suspended by the vas, he placed the patient in the lithotomy position and carried out the operation of Roux, exposing and separating the seminal vesicle and extirpating the diseased portion of the prostate. The vas deferens was divided above the ampulla and the remainder of the vasa deferentia were removed from the front with the testicles (thus differing from the operation of Roux who removed the remainder of the vasa from below with the vesicle).

Schede in 1893 (8) successfully removed both tuberculous seminal vesicles and vasa through the incision of von Dittel in a patient who had previously been castrated on both sides.

Guelliot in 1895 (11) published two cases in which he had removed the testicles through a scrotal incision and the seminal vesicles through an incision which began in the perineum and extended along the right border of the anus to the median line back of the anus, by means of which he was able to push the anus and rectum out of the way.

Baudet and Kendirdjy (8) in 1898 used the following technique—a curved incision in the perineum extending further back

to the right than to the left, exposure of prostate and seminal vesicles after division of the levator muscles. Separation and division of the vasa deferentia above the ampullæ after ligating the lower end. Division of vas and vesicle "in the interior of the prostate," a caseous nodule of which is removed. Right castration was then performed, the inguinal canal being opened and the vas deferens followed deeply and completely removed.

Comment. Practically all of the operators who have been referred to divided the levator ani muscles and deep lateral structures in exposing the seminal vesicles. In order to facilitate the removal of the seminal vesicles, various methods have been employed. The first is that of Ullmann who uses a sound in the bladder to make pressure upon the posterior wall and thus elevate the vesicles. Others caught the prostate with toothed forceps. Roux (8) employed a finger in the rectum, which was passed up above the vesicles and by pressure brought them down into view. Subsequently he employed in addition traction sutures (which have since been advocated by Squier in this country). Most operators have divided the vasa deferentia as high up as possible in the perineum, ligated and divided the upper portions of the seminal vesicles and freed them from the bladder by dissection from above downward. Legueu (8) carried out the opposite procedure, viz: division of the vesicle and vas at the upper end of the prostate and separation of these structures from the bladder by dissection from below upward. Young in 1913 (1) devised an unusually long, slender prostatic tractor which could be passed through the urethra and utilized first to expose the membranous urethra and prostate in the early dissection through the perineum and subsequently to draw down the seminal vesicles and facilitate their exposure and excision, without division of the levatores ani, and without insertion of a finger in the rectum using both traction and leverage.

In discussing the removal of the vas deferens, Baudet (8) says that it is indispensable to open the inguinal canal up to the peritoneum, to isolate the vas and liberate well it into the pelvis in order to extract it. He also thinks it is better to commence the operation from the perineum, remove the seminal vesicles and

ampullæ and then extricate the rest of the vas with the testicle from above. The vas can be drawn out easily without opening the inguinal canal.

a. The results obtained by radical operations. Baudet's analysis of 46 cases which he collected from the literature in 1906 is as follows: Inguinal method 6 cases; 2 died within a year after the operation—1 of meningitis and the other of lung tuberculosis; 2 were well one year and three months after operation; in 1 case, two months after operation, the wound was in a bad condition with tuberculosis of the operative tract; 1 patient was well on discharge, but not followed afterwards. By the median subperitoneal laparotomy method 3 cases, all bad results—the operation had been condemned by the author in a subsequent publication. The sacral method 2 cases; both recovered from operation and discharged in good condition, but not followed afterwards. The para-sacral method 5 cases; 1 with very bad wound healing, 4 left in good condition, none followed after discharge from hospital. Perineal method 30 cases; well on discharge but not followed afterwards 10, deaths 4 (respectively four years, two and one-half years and five months of lung tuberculosis; six months of tuberculous meningitis); well 16 cases, 10 of which were followed for over one year, 1 of whom died four years later of apoplexy. With the exception of the median extra-peritoneal laparotomy method, there were no immediate operative deaths during the stay of the patients in the hospital in 43 cases. In 15 of 45 cases the prostate was found involved.

The results found in the 30 cases in which the vesicles were removed through the perineum (the testicle, epididymis and vas through the groin or scrotal incision) are indeed very good and, although there were many different procedures comprised in this list, the results obtained are certainly better than have been secured even in more recent times by castration or epididymectomy alone without operation upon the vesicles. Regardless of this fact, Baudet took a very conservative attitude—that the operation of vaso-vesiculectomy should be reserved for severe cases with either very marked involvement of the seminal vesicles or with tuberculous perineal fistulae. But he remarked that

the presence of tuberculosis elsewhere than of the lungs (if not marked) did not contra-indicate operation in these cases. Roux on the other hand considered that vaso-vesiculectomy should be performed as a prophylactic operation against involvement of the other epididymis and generalization of the tuberculosis.

At the Société de Chirurgie do Paris, October 13 and November 17, 1909, (25) Baudet presented two cases of vaso-vesiculectomy for genital tuberculosis, one of which he removed through the combined perineal and inguinal method and the other entirely by the inguinal method of Villeneuve with good results. In the discussion which followed, Marion presented his conclusions as to the problem as follows:

> Vesiculectomy is a legitimate operation which deserves current usage. It relieves foci of tuberculosis dangerous for the general health and menacing to the urinary and remaining genital organs. Results of the operation, when scientifically carried out, are good in the great majority of cases. Lesions elsewhere, not due to the genital lesions alone, are contra-indications; but nevertheless cystitis aggravated by tuberculosis of the testicles is not a contra-indication. The perineal route should be employed always when there is a double vesiculitis or vesiculitis and prostatitis and when there is data as to the lesions or the single vesicle is large. The inguinal route should be reserved for single vesiculectomies, slightly involved and clearly unilateral.

In my experience this is almost impossible to determine before operation.

Legueu agreed with the above statements of Marion but stated that he would reserve the operation for more severe cases which are markedly aggravated.

b. Review of the results obtained by American operators. This may be divided into two stages—early operations (before 1902) Weir 1 case (10); Fenger 1 case (12); Walker 1 case (14); Bolton 3 cases (13); Young (20, 21, 8) 3 cases; Hutchinson 1 case (15). After that there was a quiescent period in the American literature when Whiteside's article appeared in 1910 (5), in which he reported 2 cases with excellent results in patients who were in desperate condition. The technique followed by Whiteside is to

start with the incision in the inguinal region, the vas being separated as high as possible in the inguinal canal, clamped and divided, testicle and outer portion of vas being removed. The patient was then placed on his back and through a perineal incision the seminal vesicles were exposed and freed. In order to remove the remaining vas the finger was pushed as far as possible into the depths of the retrovesical wound, then by "pushing upward on the forceps which had been previously clamped to the cut end of the vas deferens in the inguinal canal" it was possible to push this clamp through into the perineal wound, carrying the cord with it. By removing this anterior clamp and replacing it with another through the perineal wound, the entire spermatic cord and the seminal vesicle with the right lobe of the prostate was removed. The same technique was followed in the second case which was found to be much more difficult. Whiteside follows this with a second paper in 1914 (16) in which he was able to present 22 cases of vaso-vesiculectomy for tuberculosis. In this article he states again that the operation should be reserved for very difficult cases and that he had employed it in "only the old and apparently hopeless cases." He states he has modified the technique.

I have tried extirpation of prostate and vesicles from above (groin), but I will not try it again. The vesicles are easily exposed from above but the wound drains deeply and absolute failure followed by death within a short time from peritoneal infection or long continued sepsis in a deep poorly drained wound is apt to be the sequel. I believe this operation offers the only hope to life and otherwise doomed patient. In the 22 cases I have operated on in the past six years, I have had no immediate deaths and 4 eventually complete recoveries. Nine have died of pulmonary tuberculosis, 3 have died within a few months from local infection, 6 have been lost sight of—presumably they may be dead.

Comment. The fact that practically all of Whiteside's cases were in desperate condition partly accounts for the high subsequent mortality, but is it not probable that the employment of the inguinal method of Villeneuve in some of the cases, and in the others his own method of opening the inguinal canal and

pushing the clamp down from it into the pelvis retrovesically with the attached vas in removing the latter, is responsible for some of his infections and death.

In his final paper in 1919 (17), he again describes the same method of removing the vas with the assistance of the clamp through the inguinal canal into the perineal wound as above described. He then states:

> I regret that this first case is the only one of which I have certain knowledge that the remote result was successful. Several others have been under observation for months, but none for more than two years. Several have died of pulmonary tuberculosis within a year, and at least one of rapid miliary tuberculosis. As a result of my experience I strongly advise that those cases showing even slight pulmonary involvement be considered inoperable. I have operated upon three or four such with disappointing results. The wounds of operation do not heal and only add to the patient's discomfort. In such cases, when vesical tenesmus demands interference, a simple cystotomy for drainage is preferable.
>
> When we contrast the result after this very radical operation and the administration of tuberculin, with the result of any equally advanced case treated with medicine or general hygienic measures, the difference in outcome is striking. On the one hand the patients have regained health and are perhaps well; on the other, we so often see a broken down young man suffering severely and awaiting death.

In 1918 two articles have appeared in America, the first by myself, in which I described the new radical procedure which I had followed since 1914 (1) and the second by Quinby (18) who details 7 cases of radical excision of the seminal tract for tuberculosis according to my technique without a single operative death and with excellent immediate results. There was no mortality in Quinby's cases and the results obtained are indeed excellent, and fully confirm my statements in regard to the effectiveness of the radical operation.

VIII. CONCLUSIONS

Statistics show conclusively that in most cases of "genital tuberculosis" the primary focus is in the seminal vesicles. Tuberculosis of the seminal tract is therefore the better name.

From the seminal vesicles the globus minor of the epididymis is generally next attacked.

From the seminal vesicles the prostate urethra and bladder are often attacked later.

From the seminal vesicles, more rarely, the kidney may be invaded through the lymphatics along the ureter.

From the seminal vesicles by the posterior line of lymphatics, the mediastinum and the lungs may be involved.

Tuberculosis of the seminal vesicles (ampullæ and prostate if involved) ranks first in importance when a curative operation is proposed for genital tuberculosis.

Epididymectomy with injection of vas and vesicle as proposed by von Büngner is preferable to simple excision, as Cunningham has shown.

Still better results may be obtained by bringing the vas permanently out of skin in groin for frequent injection and continuous drainage as proposed by writer in 1901, and often employed.

But with all the non-radical procedures a high percentage of failures—ultimate infections of remote organs and death result.

The only hope of radical cure or complete arrestation of the disease is by the radical operation—"epididymo-vesiculectomy," or better "excision of the tuberculous seminal tract."

This operation has already saved many otherwise hopeless cases.

By the technique described by the writer, with the use of a long "urethral prostatic tractor" the urinary tract can be avoided, while the removal of vesicles, ampullæ, and prostatic lobes is facilitated.

The entire vas deferens can be removed, by the to-and-fro traction described, without opening the inguinal canal as previously done.

The incisions are comparatively small and the operation can be done under procain infiltration anesthesia (1 to 400) if the lungs are involved.

The 15 cases reported here, (in seven of which the lungs were probably previously involved, and in five one kidney tuber-

culous, etc.) with only one patient to die of tuberculosis a year later, and the others apparently completely arrested, shows the effectiveness of this radical operation.

In my opinion the only justifiable operation in tuberculosis of the seminal vesicles and epididymes is a radical excision of seminal vesicles ampullæ (and lateral lobes of prostate if involved) through the perineal prostatectomy incision, coupled with epididymectomy and extraction of the entire vas deferens, with partial or complete castration if necessary (a rare occurrence).

The old-fashioned castration is an unnecessary mutilation and does not often cure. Radical excision of the seminal tract is the operation of choice.

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DISCUSSION

Dr. W. C. QUINBY, Boston: In the first place I want to express my deep obligation to Dr. Young for pointing out to us so brilliantly and clearly how one can really cure cases of tuberculosis of the male genitalia by this very ingenious operation.

As he has said, I reported at the Detroit meeting of the American Medical Association seven cases operated on by this method, in all of which tuberculosis of the genital tract central to the involvement of the epididymis was found. I used these cases as an argument for attack on the central areas of tuberculosis in the vesicles and prostate, rather than to confine the operation to the more peripheral, and in my opinion secondary involvement of the epididymis.

Last winter at the meeting of the New England Branch of the American Urological Society held in Boston, I was able to demonstrate my first case operated in the early part of 1916, together with the most recent one at that time, about twenty-one days after operation. Both cases were in good health.

It has been my custom to follow all operated cases by letter and by personal examination every six months after operation. Although I have not recently reviewed my cases of tuberculosis of the male genitalia for this discussion, my best remembrance is that the cases now number fourteen. I am absolutely sure there has been no bad result in any instance.

The complications of the procedure have been first those of recurrence in the other epididymis, apparently unpreventable in an occasional case even by this most extensive operation, and second, the occasional short persistence of a perineal sinus. I remember two cases in which a second epididymectomy was necessary, in spite of the fact that all the structures central to the organ were removed at the previous operation. That and the occasional persistence of a sinus in three or four instances are

the only bad results, if one can call them that, which I have thus far encountered. Therefore, I am convinced that if one operates upon tuberculosis of the male genitalia at all, the operation should be a radical one. I am also convinced that operation is the best method of treatment, although some of my friends do not agree that any operation is necessary.

I am sure, you will all join with me in expressing to Dr. Young our debt of gratitude for pointing out the way to brilliant results in these cases.

Dr. FRANCIS R. HAGNER, Washington, D. C.: I think this is wonderfully good work that both Dr. Young and Dr. Quinby have done, and we are under many obligations to them for it.

It occurred to me when Dr. Young was presenting the subject that if Dr. Young or Dr. Quinby had this disease, would they be operated on.

Both of these gentlemen, I am sure, are accurate in their statements but we know very well that many of these cases live for years in comparative comfort without removal of vas, seminal vesicles, prostate, etc. I recall two cases, one a policeman who had double epididymectomy done twelve years ago. He is working today. He probably had tuberculosis of the kidney at the time the epididymectomy was done. Another man operated on eight years ago is working today. He simply had an epididymectomy done. The only advantage in this operation is to prevent abscess formation for it does not reach the seat of the disease. In most of these cases that are of central origin we ought to go slow in advising them to be operated on as I believe the most ardent advocate cannot claim he removes all the infected tissue and from some of the results I have seen I believe the patient would be better off if not operated on in this method and instead treated with T. R. tuberculin and hygienic methods.

Dr. WILLIAM F. BRAASCH, Rochester, Minnesota: Some of you may remember that a year ago I read a paper before the Association in which I reviewed the post-operative data with unilateral tuberculosis. These data included 234 male patients on

whom nephrectomy was done It was found that the genitalia were involved in 171 male patients or 73 per cent. Of this number 26 or 18 per cent were reported dead, which is somewhat less than the average mortality of 24 per cent of all patients. Although these patients had definite involvement of the prostate and seminal vesicles eighty per cent of them recovered after operation. It seems questionable whether those data could be improved by removing the prostate and vesicles. On examination of these patients several years after operation, the prostate which was formerly firm and nodular is now much smoother and softer, and frequently scarcely palpable. The same is true of the seminal vesicles. From these results we have come to the conclusion that operation for tuberculosis of the seminal vesicles or prostate is seldom advisable. Because of the tendency to suppurate removal of the tuberculous epididymis is however always indicated.

Dr. JOHN R. CAULK, St. Louis, Mo.: In correlating the embryology of the urinary and genital tracts, it impresses me that the epididymis like the kidneys would be more liable to be the seat of the primary focus than the seminal vesicles. We all know that tumors and infections of the testicle and epididymes are much more virulent than similar lesions in other parts of the genito-urinary tract. Testicular tumors are exceedingly virulent, and epididymal tuberculosis is exceedingly virulent. Tuberculosis of the kidney and seminal vesicles is not virulent. While I have not worked up my cases statistically, my impression is that the great majority of cases have gotten well following the removal of the epididymes.

I have been impressed with the fact of the severity of genital tuberculosis, that is epididymal and testicular tuberculosis. We have had two cases following a simple epididymectomy under local anesthesia which developed meningitis. We have never seen that in kidney tuberculosis. I have seen any number of prostatic and vesical tuberculoses heal after removal of the external genital tuberculosis.

While this operation that Dr. Young has described is certainly ideal if we are going to operate for massive tuberculosis, still I feel with Dr. Braasch the operation should be reserved for those cases which do not respond to our present measures of treatment, such as removal of the epididymes, followed by hygiene and tuberculin.

Dr. J. D. BARNEY, Boston: I want to pay my respects to Dr. Young and Dr. Quinby for the good operative work they have done. Dr. Young quoted me for work I did years ago. My opinion has not changed since then. I agree with Dr. Braasch and Dr. Caulk in their statement that after the removal of the epididymis these organs, the vesicles and the prostate, quiet down in case after case.

I have not the statistics at hand now, but at the time we were looking up the results intensively, and since then, I have seen a great many cases where the vesicles and prostate were very exclusively involved, hard and nodular, and where, after removal of the epididymes, and occasionally the testicle, a few months or even years afterward the prostate was hardly to be felt at all or was simply a fibrous bar, and the vesicles had similarly quieted down. I cannot, therefore, see the occasion for subjecting patients to what must be a very radical operation even in skilled hands, and where I am pretty sure, judging from what I have heard today that all of the disease cannot be removed. I do not believe these organs are tuberculous, and many of our statistics show this, and I think nobody will disagree with that statement. But when it comes to the necessity of removing them it seems to me it is absolutely unwise, because indubitably statistics show they do quiet down very appreciably and practically in spite of that operation.

I think there were possibly two cases in my series where the tuberculous process of the prostate went on and either ruptured itself and established a sinus in the perineum or was opened similar to the case which Dr. Kretschmer spoke of earlier in the afternoon. But I do not recall more than one or possibly two cases in which that happened. It seems to me, a conservative operation is still one of choice.

Dr. J. H. CUNNINGHAM, Boston: It seems to me that this subject is one of our big unsettled problems. The manner in which Dr. Young presents it and illustrates the operative technique with his pictures makes the operation seem simple and very attractive.

Realizing the desirability of eliminating all tubercular foci from the genital tract if possible I was led to do this operation some years ago and met with some difficulties, and I still feel, after considerable operative experience, that the operation can not be considered other than a technically difficult one. I have seen Dr. Young do it, which further emphasizes this fact, and I have seen some of Dr .Quinby's cases. Dr. Quinby's cases are excellent from the standpoint of immediate results. The only question is, how long they are going to remain so.

In the pathology of this subject there is one fact that everybody agrees upon, and that is, with tuberculosis of the epididymis we have the same disease in the vesicles and prostate. A collection of a considerable amount of post-mortem material, which I presented before the Association some years ago, showed that in all cases in which a microscopic examination was made of the prostate and vesicles, associated with epididymal tuberculosis that tuberculosis of the prostate and vesicles coexisted. In other words, evidences of tuberculosis were found in the prostate and vesicles as well, so that we should always feel that in tubercular epididymitis that we have not a single focus to deal with but foci in the whole tract.

The difficulties of the operation are to remove all the tuberculosis. It is an operative procedure within the limits of most of us, in some cases, but there are other instances in which the structures are so diseased that I feel we may not get the whole tract out intact without opening it and disseminating the disease. Moreover, I think when tuberculosis involves the prostate to any degree we must necessarily leave some of it; so in fact the operation itself is not radical in many instances. Realizing the limitations of the technique as illustrated by Dr. Young, that is, the complete removal of the whole tract, and while visiting this clinic (Mayo Clinic) some years ago, and seeing the tubercular

ureter injected with carbolic acid, rather than removing it after a nephrectomy for renal tuberculosis, I conceived the idea of applying the same principle to the tubercular vesicle by injecting carbolic acid through the vas deferens with the hope of destroying tuberculosis in this organ after dealing with the tubercular epididymis. I read apaper upon this method of treatment before the Urological Association meeting in St. Louis, and it was not received well. I will, however, say that this procedure has been perfectly satisfactory in my hands, and there has been no mortality. I see some of these patients occasionally, several are of years standing and the results on the whole, are the most satisfactory that I have obtained by any method of treatment.

Nothing has been said about improving the general resistance in this disease, which I consider most important. It has been mentioned that renal tuberculosis is often associated with tuberculosis in the genital tract and I have abundant evidence to support this view. Renal and genital tuberculosis is so frequently associated that I feel that we should investigate the upper urinary tract before doing any operation in these cases which are not presenting a suppurative process when first seen and in such acute cases, the investigation of the bladder and kidneys should be made after the genital condition has been dealt with. It must be believed also that foci of tuberculosis exist in other organs of the body, especially the lungs, and should be sought for and treated by appropriate methods.

I have a firm conviction that whatever treatment is applied to genital tuberculosis, that the patient must not be considered cured of tuberculosis however free from the disease the genital tract may prove to be, but that the patient once showing genital tuberculosis must be investigated by all methods to detect the disease in other organs, especially the kidneys and lungs, and even in the absence of positive findings such individuals should lead the well-known prescribed life of a tubercular individual.

Dr. A. L. CHUTE, Boston: I should like to ask Dr. Young what he considers the definite indications for this operation. I must confess that my feeling is that of the other gentlemen who

have spoken. Such cases of genital tuberculosis as I have had a chance to observe over a considerable number of years have gone on very well. The greater number of cases of tuberculous epididymitis have gone on to suppuration; a few have not. These suppurating epididymes all heal in time. Tuberculosis of the seminal vesicles is I believe in many cases so devoid of symptoms that it is overlooked.

I believe tuberculosis of the prostate is without marked symptoms in many instances. Now and then one sees an abscess of the prostate which usually breaks into the rectum. I will admit there is an occasional case of tuberculosis of the prostate that suffers a great deal but such of these as I have operated upon have been made worse. I do not feel that enough is to be obtained by this operation to make it worth while.

I shall be obliged to Dr. Young if he will outline to us a little more clearly what he considers the definite indications for this extensive operation.

Dr. W. P. WILLARD, San Francisco, California: I would like to ask both Dr. Young and Dr. Quinby in the cases operated upon on one side, how often the other side becomes involved subsequently.

Dr. JOHN R. CAULK, St. Louis, Mo.: Has there been any hemorrhage from the vas after the removal?

President SQUIER: Mr. Wade, in coming here you have seen a house divided against itself. One side of the house is anxious to hear your opinion of what you saw in Baltimore in reference to the surgical treatment of tuberculosis of the lower genito-urinary tract. The suggestion that you participate in this discussion has been made by the Galen of Urology, Dr. Young.

Mr. WADE: First of all, I have seen these cases of tuberculosis of the lower genito-urinary tract and was very much impressed with the surgical work I saw in Baltimore.

I come to you from a center of population where surgical tuberculosis is of widespread incidence. The problem it presents to us is largely one of public health. The obtaining, for the people, of a pure milk supply; I am glad to say that this is being undertaken.

We have in our hospitals many cases of tuberculosis of the lymphatic glands, and of bones and joints, and we have a certain amount of genito-urinary tuberculosis. As regards the surgical treatment of glandular tuberculosis, the battle has been fought and won and my chief, Sir Harold Stiles, has established the recognized treatment; the removal of the entire disease by properly designed and executed operative procedure. He has shown that 85 per cent of these cases of tuberculosis of glands are bovine in origin, the other 15 per cent being human infections.

Surgery by operation in these cases gives a safe, rapid and complete cure when undertaken at a stage when a complete removal of the disease is possible, and when carried out in a manner such as to ensure this being done.

As regards joint tuberculosis he of course was the leader of the one school of practice and Sir Robert Jones of Liverpool of the other school, who practice a conservative nonoperative treatment for joint tuberculosis, a line of treatment that is now almost universally carried out.

As regards genito-urinary tuberculosis it seems to me I have heard advocated here today by certain of the speakers a third school of practice which is neither operative for the entire removal of the disease nor conservative for its cure by prolonged rest and improvement of the patient's general health by constitutional treatment, but a partial combination of both, possessing the advantages of neither.

If I might be permitted to express my opinion from the standpoint of surgical pathology, I would say: If you operate on these cases do so with the object of entirely eradicating the disease. If not leave them to the physicians to be treated on conservative lines but do not attempt a combination that will prove unsatisfactory. I would say to Dr. Braasch in this connection that we look to Rochester, this Mecca of surgery, for even better results

than he has so far obtained. We expected him to be dissatisfied with a line of treatment when 20 per cent of his cases do not obtain a cure of the disease. The ideal we expect of his clinic is an hundred per cent cure. I would, therefore, give my vote for Dr. Young in favor of his practice of complete eradication of the disease, when the clinical indications show that it is confined to the genital tract in such a manner as to permit of its entire excision by radical operative measures.

I would like to ask Dr. Young to what extent does he think genito-urinary tuberculosis is bovine in origin? For if it be so in the majority, it will in consequence be much more readily self curative, as is observed with cervical lymph gland tuberculosis. But, nevertheless, even in the latter this result is only obtained after two or three years prolonged and careful treatment, and even then recurrence of the disease necessitating operation is not infrequent.

DR. YOUNG (closing the discussion): Gentlemen, I would like to have you go home and get out your cases of tuberculous seminal tract, and follow your cases up. Remember that many of those you get no replies from are dead. Dr. Barney admits that in 50 per cent of the cases the other side is involved, and that 27 per cent of his cases of epididymectomy and castration died of tuberculosis. Everyone who has made the careful study of statistics that he and Keyes have made has shown a deplorable situation. Of course, all of us know of cases where tuberculosis has quieted down, but many of these cases disappear when you try to follow them several years, and the reason they disappear is because three or four or ten years later they develop lung tuberculosis, as admitted by Dr. Braasch. In the body of my paper, I have carefully analyzed the literature, and three series of cases from the Johns Hopkins Hospital. I refer you to those tables which, to my mind, prove conclusively that the disease is generally primarily in the seminal vesicles, and that no one has obtained really good results with the external partial operation.

Another thing: The radical operation is not formidable and the convalescence is often short. Some of these patients have left the hospital within two weeks from the time they were operated on. They often go through a shorter period of convalescence than prostatectomy cases. There is little hemorrhage. They usually heal up rapidly, and very few have sinuses afterward. If there is a persistent sinus, it should not be considered in the light of a complication but as a safety valve. The few drops of pus cause little discomfort, and as it comes from a small focus of tuberculosis, it is certainly safer for it to come out through the scrotum or through a small perineal sinus than to remain pent up. It is certainly a whole lot better to remove the tuberculous mass than to leave it locked up in the seminal vesicle with only a capillary duct to drain it.

The situation is this: All of you admit that in most of these cases of tuberculosis of the epididymis the prostate and seminal vesicles are involved in the great majority of cases. All of you have to admit that the seminal vesicles are not well drained through the ejaculatory ducts.

Quinby and I are convinced that the operation is not a severe one. It is an operation that can be carried out under novocain with just a little whiff of gas, occasionally with the patient talking during most of the time. In one of my cases, the vesicles and one testicle were removed under cocain anesthesia. In this case one lung was involved.

Tuberculosis of the seminal tract is a very fatal disease, even after castration or epididymectomy. The focus from which it is generally disseminated to the epididymis, the prostate, the bladder and the kidney and lungs is in the seminal vesicles.

Radical excision is a safe practical operation, and has already saved many otherwise fatal cases. It is the operation of choice in all cases not manifestly confined to the epididymes. In answer to Dr. Hagner, I will say that if I had the disease, I would want it thoroughly removed, just as I would not trust a tuberculous kidney to drainage through the ureter.